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PROCEEDINGS

OF THE

SCIENTIFIC MEETINGS

OF THE

ZOOLOGICAL SOCIETY

OF LONDON

FOR THE YEAR

1885.

PRINTED FOR THE SOCIETY,
AND SOLD AT THEIR HOUSE IN HANOVER SQUARE.

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LIST

OF THE

COUNCIL AND OFFICERS

OF THE

ZOOLOGICAL SOCIETY OF LONDON.

1885.

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(*Elected April* 29, 1885.)

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LIST

OF THE

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With References to the several Articles contributed by each.

LIST OF PLATES.

1885.

LIST OF WOODCUTS.

1885.

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1885.

J. Smit lith.

Hanhart imp.

CERVULUS CRINIFRONS ♂

PROCEEDINGS

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OF THE

ZOOLOGICAL SOCIETY OF LONDON.

January 20, 1885.

Prof. Flower, LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions made to the Society's Menagerie during the month of December 1884:—

The total number of registered additions to the Society's Menagerie during the month of December was 68, of which 3 were by birth, 35 by presentation, 7 by purchase, 9 by exchange, and 14 were received on deposit. The total number of departures during the same period, by death and removals, was 122.

Amongst the additions during the month attention was called to:—

1. A Muntjac, deposited by Mr. H. E. Dresser, F.Z.S., on December 20th, which appears to belong to a species distinct from any yet described, and which, with Mr. Dresser's approval, I propose to call the Hairy-fronted Muntjac (*Cervulus crinifrons*). This animal is readily distinguishable from the Muntjacs hitherto known to us by the long hairs which spring from the forehead and summit of the head, and almost conceal the short horns, and by its much longer tail. The single male specimen received was transmitted to this country by A. Michie, Esq., of Ningpo, China, and was doubtless obtained in that part of China.

It may be shortly described as follows:—

Cervulus crinifrons, sp. nov. (Plate I.)

Form of *C. vaginalis*, but rather larger in size and tail much longer. General colour dark brown, passing into blackish on the limbs and sides of rump. Head, ears, and elongated hairs of the bushy forehead light brown, rather yellowish. Upper surface of tail black.

Under surface of tail and buttocks pure white. Belly and limbs dark. Height about 24 inches, length of tail about 9 inches.

Hab. Vicinity of Ningpo, China (*A. Michie*).

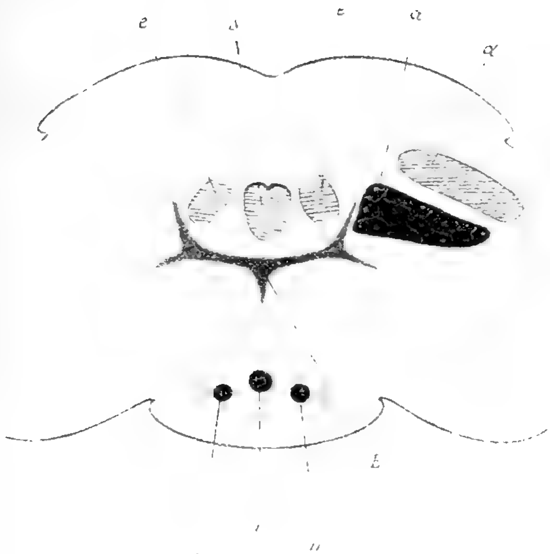
Head of *Cervulus crinifrons.*

Obs. Readily known from all other species of *Cervulus* by its bushy forehead, which much resembles that of *Elaphodus michianus,* and by its long tail.

2. A young male Nubian Ibex (*Capra nubiana*), presented December 30th by Mrs. Laing, of Thornhill, Sunderland. This Ibex is accompanied by a Domestic Goat, with which it has bred and produced a male hybrid, which closely resembles its male parent. The species is new to the Society's Collection.

Mr. Sclater called attention to the breeding of a pair of the Chinese Blue Magpie (*Cyanopolius cyanus*) in the Society's Gardens in 1884, and exhibited specimens of their eggs. Six eggs were laid in May in an open nest, made of sticks and lined with grass and wool, in the Western Aviary. The period of incubation was about 18 days, and four young birds were hatched on June 11. The young birds remained about three weeks in the nest. They had black heads upon assuming their first plumage, but at first of a dull black. By the end of the year they were so like their parents that it was impossible to distinguish them. About a fortnight after the young birds left the nest a second clutch of eggs was laid, but came to nothing.

The eggs were of a pale greenish stone-colour, freckled with two



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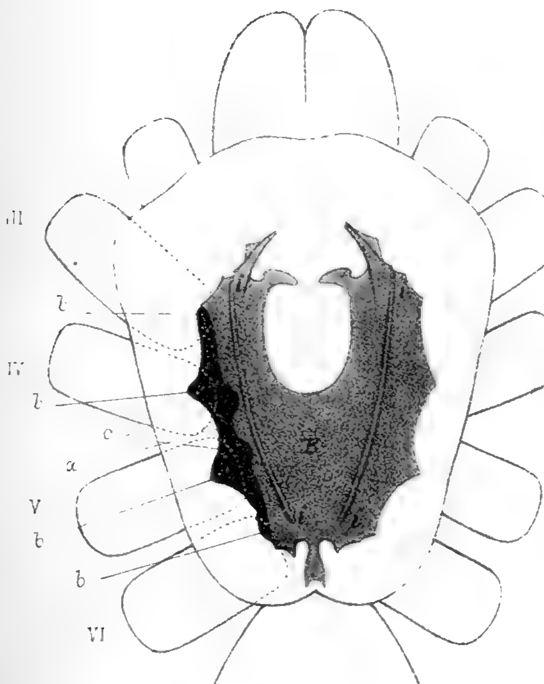

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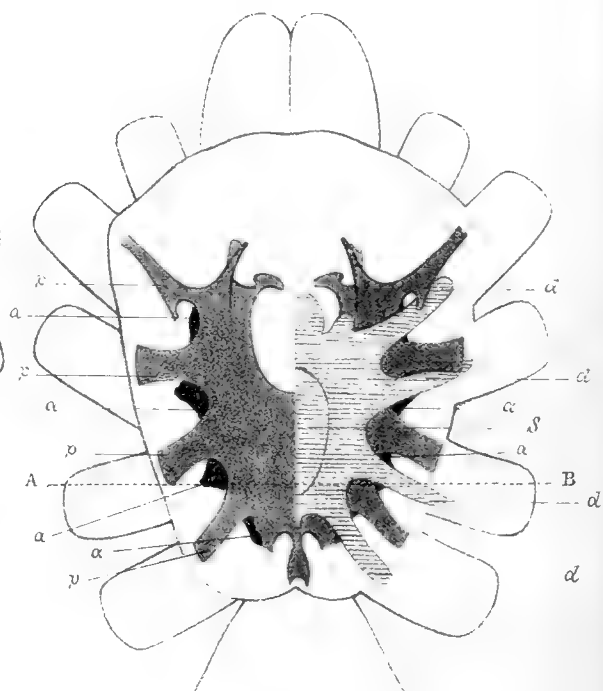

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J. Smit lith.

Hanhart imp.

COXAL GLANDS OF MYGALE.

shades of pale reddish brown, and measured 1·1 inch by 0·75. They were much darker than eggs of *Cyanopolius cooki* (from Mr. Seebohm's collection), also exhibited, and more pyriform in shape and not quite so large.

Prof. Bell exhibited some models illustrating the paper of Rathke on the development of the great blood-vessels in the Vertebrates, which he had lately obtained for the Anatomical Museum at King's College from Herr Englert of Heidelberg.

Mr. W. B. Tegetmeier, F.Z.S., exhibited a specimen of a Cat, which he referred to the Wild Cat (*Felis catus*), obtained in Donegal, and an example of a singular variety of the Black Grouse (*Tetrao tetrix*).

The following papers were read:—

1. On the Coxal Glands of *Mygale*. By Paul Pelseneer, D.Sc. (Communicated by Prof. Lankester, F.Z.S.)

[Received November 20, 1884.]

(Plate II.)

Two years ago Prof. Ray Lankester described and figured the position of an organ which he observed in the Scorpions, and which he called the "coxal gland"[1]. This gland, which, as he recognized, was not provided with an efferent duct, had been considered by Newport[2] and others as an appendage of the alimentary canal.

Prof. Lankester announced at the same time that he had ascertained the existence of this organ in transverse sections of the cephalothorax of a large *Mygale* (*Theraphosa*) from South America; and he identified these "coxal glands" with the "brick-red gland" described by Packard in *Limulus*[3].

More recently[4] he has again remarked on the existence of this organ in transverse sections of *Mygale* (*Ctenizа*) *cœmentaria*, Latr.

But in no Araneid as yet has the form and position of the coxal gland been either described or figured from an anatomical point of view; and as far as *Mygale* in particular is concerned, none of the authors who have occupied themselves with the organization of the genus have mentioned any organ which can be considered to represent this gland[5].

[1] "The Coxal Gland of *Scorpio*," Proceedings of the Royal Society, June 1882.

[2] Philosophical Transactions, 1843, pl. xv. fig. 39.

[3] "On the Anatomy, Histology, and Embryology of *Limulus polyphemus*," Anniv. Mem. of the Boston Society of Nat. Hist 1880.

[4] "On the Skeleto-trophic Tissues and Coxal Glands of *Limulus, Scorpio*, and *Mygale*," Quart. Journ. of Micr. Sci. 1884.

[5] One can nevertheless recognize the presence of the coxal gland in a good

During the month of October 1884 a large living *Mygale* (*Theraphosa*), from South America, was placed by the Secretary of the Zoological Society of London at the disposal of Prof. Lankester, who had the kindness to entrust it to me in order that I might make out the position of the coxal gland. He gave me at the same time the series of transverse sections of the cephalothorax of *Mygale cœmentaria*, which he had made at an earlier date.

Having carefully studied the latter, I drew those which passed through the coxal gland, whenever this presented any change of shape, size, or position. One of the sections in which the gland presents its greatest development is shown in Plate II. fig. 1.

By the help of this series of drawings I was able to construct two diagrams, one of which showed the vertical projection (view from the side) of the gland, the other the horizontal projection (view from above). The latter is shown in Plate II. fig. 2.

In his recent paper [1] Prof. Lankester expressed the expectation, after examining sections of a South-American *Mygale*, that the coxal gland was not a simple ovoid glandular body, as in *Scorpio*, but that it was furnished with lobes corresponding to the coxæ of the cephalothoracic appendages, as in *Limulus*. The figure shows how well founded this anticipation was.

Taking these two diagrams as my guide, I looked for the coxal gland of the large *Mygale*, which was still pretty fresh, as it had only lain for a few days in 60 per-cent. alcohol, having been opened and washed with normal salt solution ($\frac{3}{4}$ per cent.) after being killed, and I was able to dissect it out completely.

The two glands, which are quite separate, are placed on each side of the cephalothorax, at the side of the entosternite (enthodère of Dugès), between the lower plate and the upward prolongations of it, to which latter they are intimately related in position, size, and form [2].

Surrounded by the connective tissue with large brown cells, which is found scattered through the entire body of *Mygale* [3], they extend as far as the edge of the lower plate of the entosternite, and have four lobes which correspond to the projections of this plate and at the same time to *the four last* appendages of the cephalothorax (ambulatory legs) [4].

The anterior and posterior lobes of the gland are the largest, and are parallel in direction to the long axis of the body. The second and

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section of *Mygale javanensis*, Walk., given by Liénard, "Recherches sur la structure de l'appareil digestif des Mygales et des Néphiles," fig. 2 A (Bull. Acad. Belg. 1878). The gland is shown under the upper part of the diverticulum of the stomach, between its bend and the entosternite.

[1] *Loc. cit.* p. 52.

[2] The relations between the entosternite and the coxal glands are the same in *Limulus* and *Scorpio* as in *Mygale*, as is easily seen from the works published on this subject.

[3] This tissue is analogous to that observed in *Scorpio* by Prof. Lankester (*loc. cit.* pl. xi. figs. 9–10), but the cells are larger, fewer in number, and more scattered.

[4] And not to the second, third, fourth, and fifth appendages, as in *Limulus*.

third lobes are shorter, thicker, and directed transversely; they extend slightly beyond the edges of the entosternite, and descend a little way into the coxæ of the fourth and fifth appendages.

In addition to these four coxal prolongations, the gland has again two internal projections near its middle third. These projections correspond to two slight excavations of the entosternite, between its lower plate and its upper prolongations. The latter pass above the gland between its coxal lobes, so that only the extremities of these can be seen between the prolongations of the entosternite.

The annular stomach, which rests on the entosternite, sends its lateral diverticula between these superior prolongations. The four posterior diverticula of the stomach[1] pass above the lobes of the coxal gland, are then bent back, and pass between the muscles of the corresponding coxæ, and extend below the cepalothoracic ganglion.

The colour of the gland is uniform, a brownish yellow not unlike that of the stomach and its lateral diverticula. Its appearance is coarsely cellular, showing distinctly the groups of cells of which it is made up.

I have nowhere seen any efferent duct, either passing to the exterior, or to any internal organ. The gland in *Mygale*, like that of the adult *Limulus* and *Scorpio*, is therefore a closed gland.

The shape and position of the coxal gland, as I have observed them in this large South-American *Mygale*, do not represent an isolated fact or one peculiar to this species alone. The diagram Plate II. fig. 2 shows in fact that in *Mygale cœmentaria*, and consequently in all the Tetrapneumones, the relations of the gland are almost completely identical[2].

When it is possible to study fresh specimens of *Limulus, Scorpio,* and *Mygale,* I think it would be useful to examine the contents of the gland from the chemical point of view. The result of such an examination would certainly help to determine the physiological function of this curious organ[3].

EXPLANATION OF PLATE II.

Fig. 1. Diagram of a transverse section of the cephalothorax of *Mygale cœmentaria*, Latr. (×9), passing through the coxæ of the third pair of ambulatory legs, and showing the relations of the right coxal gland (*a*) with the entosternite (*E*) and the digestive apparatus; *d*, lateral

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[1] In addition to the four large pairs of lateral diverticula, there is also a small anterior pair, at the base of the first lateral pair. (See Plate II. fig. 4.)

[2] The slight difference which is to be observed in the diagram fig. 2, on the inner side of the gland at the base of the fifth pair of appendages, was probably caused by the fact that this point corresponds to a certain number of imperfect sections. I think that for the rest, the diagram is sufficiently exact; and if one were to examine the coxal gland of *Mygale cœmentaria*, I think it would be found that its shape is very near to that indicated by the diagram.

[3] P.S.—March 20th, 1885. After the reading of this paper, I was able to consult Blanchard's "Organisation du règne animal." In the fig. 2, pl. xvi. (Arachnides) of this work, one can recognize the coxal gland in the so-called "glande stomacale." But the corresponding text, unfortunately, does not exist.—P. P.

diverticula of the annular stomach; *e*, annular stomach; *S*, suctorial organ; *m*, nerves of the fourth pair of ambulatory legs; *n*, abdominal nerve.

Fig. 2. Diagram of the left part of the cephalothorax of *Mygale cæmentaria*, Latr., to show the horizontal projection of the coxal gland; ×6½. *a*, The coxal gland. 1, Cheliferæ. 2, Chelæ. 3–6, The four last pairs of cephalothoracic appendages. A. Abdomen.

3. The same specimen as in fig. 4. To the left hand the upper prolongations (*p*) of the entosternite show only the coxal lobes (*a*) of the gland; on the right, the same prolongations and the lateral diverticula (*d*) of the annular stomach hide all but very small parts (*a*) of the gland. *S.* Suctorial organ.

4. The left coxal gland and the entosternite of *Mygale*, sp., from South America, *in situ*, dorsal view; ×2½. The superior prolongations of the entosternite have been removed along the line *ii*, to show, on the right side, the coxal gland in its entirety, and on the right side the lower plate of the entosternite, which on the left is hidden by the gland. *a*, The coxal gland; *b*, its coxal lobes; *c*, its internal projections. *E*, The entosternite. 3–6, The coxæ of the ambulatory legs. *A.B*, Line showing the direction of the section in fig. 1.

2. On the Myology of the Water-Opossum. By E. J. Sidebotham, B.A., late Assistant Demonstrator of Anatomy, Cambridge.

[Received November 20, 1884.]

Through the great kindness of Professor Macalister I have had the opportunity of making a careful dissection of the muscular system of the Water-Opossum (*Chironectes variegatus*).

The specimen, which was that of a young male, was a spirit one, and the muscles were in a very good state of preservation.

When I received it the skin and abdominal viscera had been removed, some of the superficial muscles were considerably damaged, and most of the terminal phalanges had disappeared.

It had the following dimensions:—

	centim.
Extreme length	59
Length of tail (measured from sacro-iliac synchondrosis)	37·4
Length of humerus	4·1
Length of femur	5
Length of tarsus (terminal phalanx having disappeared)	6·1

Through the courtesy of Professor Flower I was enabled to measure the five specimens of this animal in the National Collection at South Kensington.

The four stuffed specimens varied in length from 68·7 cm. to 41·5 cm., the tarsus varying from 6·7 cm. to 3·9 cm.

The skin of the remaining specimen measured 67·6 cm. in length, the femur 5·6 cm., the humerus 4·7 cm., and the tarsus 5·9 cm.

Muscles of Anterior Extremity.

Rhomboideus.—Indivisible, arising from inner two thirds of occipital crest, from spines of cervical and first five dorsal vertebræ.

The anterior few fibres are inserted into base of spine, the rest by a broad muscular mass into base of scapula, being embraced in posterior half by serratus magnus.

Acromio-trachelien (omo-atlantic).—Arises by a flat tendon from anterior arch of atlas, and by a small accessory slip from basioccipital. The greater part of the muscle is inserted into dorsal third of spine of scapula, whilst a thin slip, leaving muscle in its lower third, crosses insertion of omohyoid, and is inserted into base of scapula in close connection with inner portion of serratus magnus.

Cleido-occipital.—Arises near middle of clavicle by muscular fibres, and is inserted into occipital crest internal to cleido-mastoid, its posterior fibres being continuous with trapezius for half an inch. Its anterior fibres are just united with cleido-mastoid at their insertion.

Cleido-mastoid.—Overlain by sterno-mastoid except just at its origin. Arises from front of clavicle at its sternal end by fleshy fibres. It forms a broad, flat muscle, inserted by a rounded mass into occiput between sterno-mastoid and digastric, and by coarse fasciculi into occipital crest for its outer half.

Sterno-mastoid.—Arises from front of manubrium sterni by tendinous and fleshy fibres, close to its fellow of opposite side. It forms a broad fleshy belly, inserted by a tendon into front of mastoid process just behind external auditory meatus. It is continuous just at its insertion with cleido-mastoid.

Trapezius.—This muscle was much damaged. It apparently arises from occipital protuberance, its anterior fibres being continuous with posterior fibres of cleido-occipital, from spines of cervical and dorsal vertebræ. Its anterior and middle fibres are inserted into whole length of spine of scapula, whilst its posterior ones pass forwards to be inserted into the spine at its dorsal part.

Latissimus dorsi.—Arises from spinous processes of dorsal vertebræ, and from lumbar fascia which attaches it to lumbar vertebræ and crest of ilium. Inserted by narrow tendon into inner lip of bicipital groove of humerus.

Dorsi epitrochlear.—A thin muscular slip arising from outer surface of latissimus dorsi by tendinous fibres, and inserted into fascia on inner side of arm which attaches it to olecranon.

Serratus magnus.—Arises by thirteen digitations from posterior six cervical transverse processes, closely connected with insertion of scalenus, and from outer surface of first seven ribs. The anterior fibres are inserted into inner lip of base of scapula, whilst the posterior digitations curve round to outer lip of base, embracing insertion of rhomboideus.

Subclavius.—Arises from cartilage of first rib and is inserted into posterior border of clavicle at its outer half, a few of its inner fibres being continuous with the following portion, which arises by muscular fibres from the posterior border of clavicle at its outer two thirds, and is inserted by thin tendinous fibres into anterior border of acromion.

Pectoralis major.— Consists of two portions :—*a*, a large triangular mass arising from whole length of sternum and ensiform appendix. Fibres converge to a tendon—the posterior ones underlying the anterior ones—which is ultimately united with tendons of chondro-humeral and pectoralis quartus and is inserted into outer lip of bicipital groove of humerus. Its anterior fibres are continuous for a short distance with clavicular portion of deltoid.

β. Underlies preceding portion. It arises in close connection with it from middle of sternum opposite third, fourth, and fifth ribs. Its fibres converge to a flat narrow tendon, which is inserted into outer lip of bicipital groove on a level with upper portion of preceding tendon.

Rectus sternalis.—Arises by three tendinous slips from junction of fourth, fifth, and sixth ribs with sternum. It is inserted into anterior surface of first rib at about its middle.

Pectoralis quartus.—Arises from fascia lying between scapula and pectoralis major. It is inserted into outer lip of bicipital groove of humerus with chondro-humeral.

Chondro-humeral.—A thin band arising in middle line from aponeurosis covering external oblique. Inserted with pectoralis quartus.

Supraspinatus.—Arises from supraspinous fossa, inserted into anterior part of neck of humerus, and shoulder capsule.

Infraspinatus.—Arises from infraspinous fossa. Inserted just below preceding.

Teres minor.—Arises from ventral half of posterior border of scapule between infraspinatus and scapular head of triceps. Inserted just below infraspinatus.

Teres major.—A thick fleshy muscle, arising from posterior superior angle of scapula. Inserted by a flattened tendon into inner lip of bicipital groove.

Deltoid.—Clavicular and scapular positions quite distinct, excepting just at their insertions.

Clavicular portion arises from anterior border of outer half of clavicle and from a small portion of acromion. Inserted into anterior surface of humerus at its upper third, being connected both at its origin and insertion with pectoralis major.

Scapular portion arises from posterior surface of spine of scapula and upper portion of infraspinous fossa. Inserted just above clavicular portion.

Coraco-brachialis (brevis).—Arises from coracoid, and is inserted into inner part of neck of humerus.

Subscapularis.—Arises from subscapular fossa. Inserted into inner part of humerus, near to neck.

Levator scapulæ.—Arises by a rounded tendon from anterior arch of atlas just internal to acromio-trachelien, and by a few fibres behind this. Its fibres, diverging, are inserted into ventral third of spine of scapula and acromion.

Biceps.—Arises by a flat undivided tendon from coracoid and upper margin of glenoid. It consists of two bellies, which are distinct, but closely applied, the coraco-radial one being superficial. If the tendon is forcibly torn, the coraco-radial head is seen to arise from both coracoid and glenoid, the gleno-ulnar arising from glenoid alone. The former is inserted into radial tubercle; the latter is inserted with brachialis anticus into coracoid process of ulna.

Triceps.—Arises by three heads. Long one arises from lower part of posterior border of scapula, by tendon in its lower two thirds, and in its upper third by muscular fibres, which pass obliquely on to outer aspect and are inserted into tendon. Inner and outer heads partly separated by musculo-spiral nerve, arising from inner and posterior aspects of humerus, and from intermuscular septum separating outer head from brachialis anticus. Fibres from outer head pass obliquely into long head at its lower third, and partly into outer side of olecranon. Most of fibres of inner head are inserted into anterior part of long head, a few being inserted into inner side of olecranon. Long head is inserted into tip of olecranon.

Anconeus internus.—Arises from back of internal condyle of humerus, and is inserted on inner side of tip of olecranon. Its upper fibres are continuous with inner head of triceps, being separated from it by ulnar nerve. Its lower fibres are separated from flexor carpi ulnaris by a fibrous septum.

Anconeus externus.—Arises from back of external condyle of humerus. Inserted into outer side of olecranon and outer side of ulna for its upper fifth. Its upper fibres are continuous with outer head of triceps.

Brachialis anticus.—Arises from outer side of humerus in its whole length. Inserted into ulna, just outside insertion of gleno-ulnar portion of biceps.

Palmaris longus.—Arises by fleshy fibres from internal condyle of humerus and lower part of supracondyloid ridge. Inserted into flexor tendon in palm. Two portions of it are quite distinct from main mass—one, which arises from internal condyle, and whose tendon underlies principal tendon, is inserted into the lower part of it; the other leaves the inner side of the muscle and is inserted into the inner side of its tendon.

Flexor carpi radialis.—A thin muscle arising from internal condyle of humerus. Inserted into radial side of base of metacarpal of medius.

Flexor carpi ulnaris.—Arises from internal condyle of humerus, from posterior surface of olecranon, and from bridge between the two, closely connected with anconeus internus. Its superficial fibres form a thin belly inserted by a very thin tendon into base of metacarpal of minimus; the remainder forms a strong tendon inserted into pisiform.

Flexor digitorum profundus.—Consists of three parts all closely connected.

Condylar portion, superficial, arising from internal condyle of humerus, closely connected with flexor carpi ulnaris.

Ulnar portion, the largest, arising from upper third of ulna and outer surface of olecranon.

Radial portion arises from upper third of radius, internal to oblique line.

Tendon grooved, tendon of palmaris longus first lying in it, and then inserted into it. Common tendon divides into five, which are inserted into bases of terminal phalanges of fingers.

Lumbricales three in number:—1. Arising from second and third flexor tendons, inserted into outer side of medius. 2. Arising from third and fourth flexor tendons, inserted into outer side of annularis. 3. Arising from ulnar side of fourth tendon, inserted into outer side of minimus.

Flexor digitorum sublimis.—Arises from lower third of flexor profundus as a small muscular belly. It gives cff three tendons, each of which splits opposite first inter-phalangeal joint, and allows tendon of deep flexor to pass through. The split tendons then rejoin, and are inserted into upper third of second phalanges of index, medius, and annularis.

Pronator radii teres.—Arises from internal condyle of humerus, and is inserted into outer border of radius at its middle third.

Pronator quadratus consists of thin fibres extending between anterior surfaces of radius and ulna in their lower half.

Supinator longus.—A well-developed muscle, arising from upper part of external supracondyloid ridge of humerus, anterior to extensor carpi radialis longior, with which it is closely united at its origin. At its lower third it ends in a thin tendon, which, becoming closely applied to external lateral ligament, is inserted into dorsal and outer surfaces of wrist.

Extensor carpi radialis longior.—Arises from external supracondyloid ridge of humerus and external condyle, being united with following muscle for about an inch. Tendon inserted into outer side of metacarpal of index at its proximal third.

Extensor carpi radialis brevior.—Arises in close connection with preceding muscle, inserted into outer side of metacarpal of medius at its proximal third.

Extensor digitorum communis.—A somewhat small muscle, arising from external condyle of humerus in common with extensor minimi digiti. Tendon divides into three—one passing to dorsum of index, another dividing and passing to medius, whilst the third one divides, one division passing to annularis whilst the other passes to minimus.

Extensor minimi digiti.—Thin, arising from external condyle of humerus with common extensor. Its tendon divides into two, which are inserted on ulnar sides of tendons from common extensor passing to annularis and minimus.

Extensor carpi ulnaris.—Arises from outer condyle of humerus, inserted into inner side of wrist.

Extensor secundi internodii pollicis.—Arises from inner side of olecranon, and inner side of upper fourth of posterior surface of ulna. Its tendon divides into two slips—one being inserted into base of first phalanx of thumb, the other into base of first phalanx of index, on radial side of common extensor.

Extensor ossis metacarpi pollicis.—Arises from extensor surface of ulna in its upper half and from upper third of radius. Tendon inserted into base of metacarpal of thumb on its outer side.

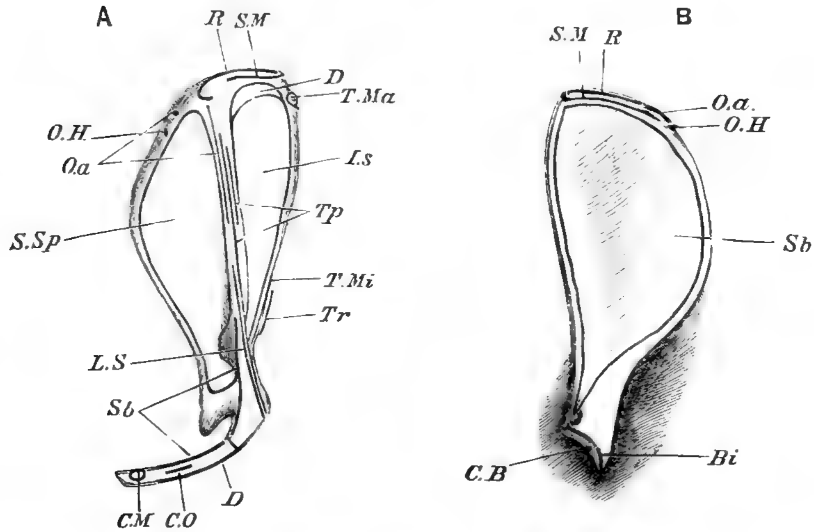
Supinator brevis.—Arises from external condyle of humerus. Its upper fibres pass in a sling-like manner round head of radius, whilst its lower fibres pass obliquely downwards and inwards and are inserted into surface of radius external to its oblique line.

Muscles of Hand.

Dorsal group.—*Abductor pollicis.*—Arising from annular ligament, trapezium, and scaphoid, slightly united at its origin with flexor brevis pollicis; inserted into outer side of base of first phalanx of thumb.

Abductor minimi digiti.—Much larger than preceding, arising by

Fig. 1.



Myology of Water-Opossum.

R., rhomboideus; *S.M.*, serratus magnus; *D.*, deltoid; *T.Ma.*, teres major; *O.H.*, omo-hyoid; *O.a.*, omo-atlantic; *S.Sp.*, supra-spinatus; *I.s.*, infra-spinatus; *Tp.*, trapezius; *T.Mi.*, teres minor; *Tr.*, triceps; *L.S.*, levator scapulæ; *Sb.*, subclavius; *C.M.*, cleido-mastoid; *C.O.*, cleido-occipital; *C.B.*, coraco-brachialis; *Bi.*, biceps.

two heads from annular ligament and pisiform. Inserted into base of first phalanx of minimus.

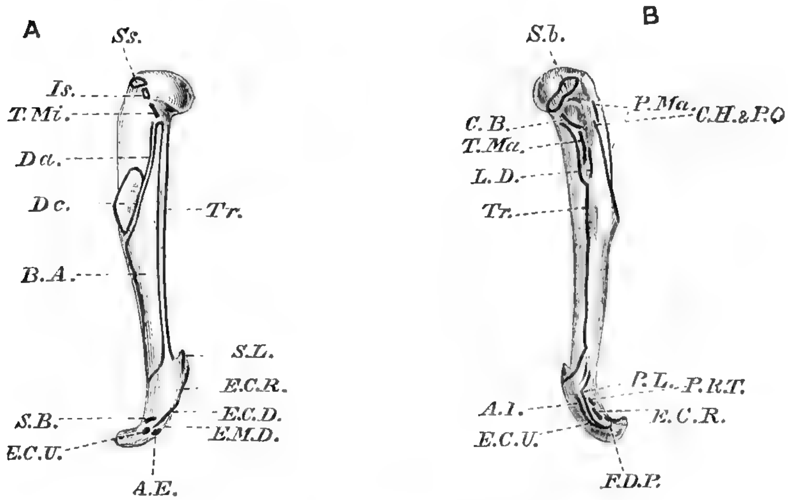
First dorsal interosseous.—Arises from palmar surface of metacarpal of thumb. Inserted into radial side of first phalanx of index.

Second dorsal interosseous.—Arises from radial side of base of metacarpal of medius, and ulnar side of metacarpal of index in its whole length. Arched tendon, the larger end being inserted into radial side of base of first phalanx of medius, and the smaller end passing on to palmar surface of metacarpal of index.

Third dorsal interosseous.—Arises from radial side of metacarpal of medius in its proximal half, and dorsal surface of metacarpal of annularis in its proximal third. Similar arched tendon, the larger and thicker portion passing to base of first phalanx of medius, whilst thinner portion passes on to palmar surface of metacarpal of annularis.

Fourth dorsal interosseous.—Arises from dorsal surface of metacarpal of annularis and radial side of metacarpal of minimus. Inserted into palmar surface of heads of metacarpals.

Fig. 2.



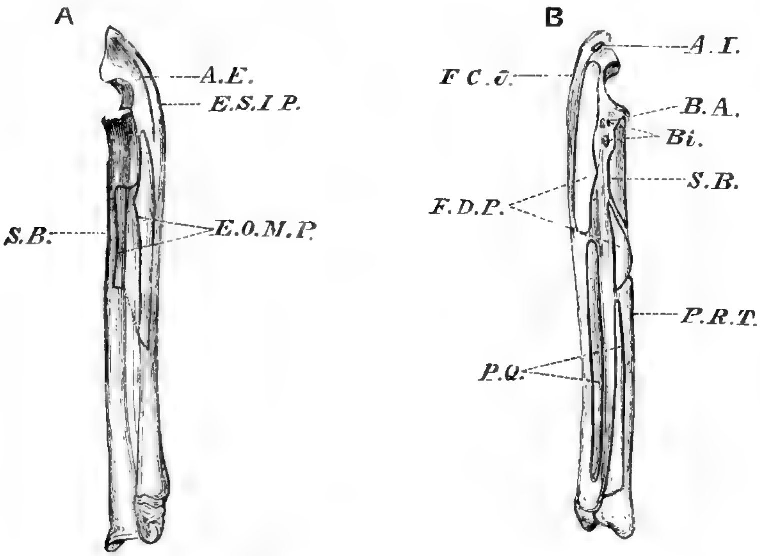
Myology of Water-Opossum.

Ss., supraspinatus; *Is.*, infraspinatus; *T.Mi.*, teres minor; *Da.*, deltoid, acromial part; *Dc.*, deltoid, clavicular part; *B.A.*, brachialis anticus; *S.L.*, supinator longus; *E.C.R.*, extensor carpi radialis longior et brevior; *E.C.D.*, extensor communis digitorum; *E.M.D.*, extensor minimi digiti; *S.B.*, supinator brevis; *E.C.U.*, extensor carpi ulnaris; *A.E.*, anconeus externus; *Tr.*, triceps; *Sb.*, subscapularis; *P.Ma.*, pectoralis major; *C.B.*, coraco-brachialis; *T.Ma.*, teres major; *C.H.*, chondro-humeral; *P.Q.*, pectoralis quartus; *L.D.*, latissimus dorsi; *Tr.*, triceps; *P.L.*, palmaris longus; *P.R.T.*, pronator radii teres; *A.I.*, anconeus internus; *E.C.U.*, extensor carpi ulnaris; *F.D.P.*, flexor digitorum profundus.

Palmar group.—Five in number and have a common origin in palm. The first three pass to radial side of first phalanges of thumb, index, and medius, whilst the other two pass to the ulnar side of the remaining fingers.

Intermediate group.—Each finger is provided with a short flexor, each of them consisting of two bellies more or less united and inserted at each side of their respective phalanx, with the exception of the flexor brevis medii, which is single and is inserted into tendon of third dorsal interosseous.

Fig. 3.



Myology of Water-Opossum.

A.E., anconeus externus; *E.S.I.P.*, extensor secundi internodii pollicis; *E.O.M.P.*, extensor ossis metacarpi pollicis; *S.B.*, supinator brevis; *A.I.*, anconeus internus; *F.C.U.*, flexor carpi ulnaris; *B.A.*, brachialis anticus; *Bi.*, biceps; *S.B.*, supinator brevis; *F.D.P.*, flexor digitorum profundus; *P.R.T.*, pronator radii teres; *P.Q.*, pronator quadratus.

Muscles of Posterior Extremity.

Gluteus maximus.—A thin triangular muscle, arising chiefly by fascia from anterior superior spine of ilium, from transverse processes of sacral vertebræ, and from caudal vertebræ as far as third or fourth. Anterior and middle fibres converge to be inserted into outer aspect of root of great trochanter; posterior fibres inserted into linea aspera for its upper two thirds. It is quite free posteriorly, but in front turns round gluteus medius and joins anterior border of gluteus minimus.

Gluteus medius.—Thin posteriorly, but thick and partly divisible into three laminæ anteriorly. Arises from dorsum ilii, anterior superior iliac spine, and sacral vertebræ, continuous anteriorly with gluteus maximus. Its superficial part is inserted into outer surface, its deep part into upper border of great trochanter.

Gluteus minimus.—Thin, arising from border of ilium between iliacus and gluteus medius. Inserted into anterior border of great trochanter, being continuous both at its origin and insertion with gluteus maximus.

Gluteus quartus.—Thin muscular fibres, closely applied to capsule of hip-joint, arising superficial to rectus tendon and closely connected with it. It is inserted just below inner part of neck of femur between psoas and vastus internus.

Pyriformis.—Arises from side of sacrum half an inch behind sacro-iliac synchondrosis. It is inserted by a narrow tendon into summit of great trochanter.

Obturator externus.—Arises from margin of obturator foramen and membrane; inserted by a flattened tendon into digital fossa with obturator internus.

Obturator internus.—Arises from descending ramus of pubes and a small portion of ascending ramus of ischium. Tendon plays over small sciatic notch and is inserted into digital fossa with obturator externus.

Gemellus superior consists of two distinct parts. The first arises from ascending ramus of ischium in front of groove for tendon of obturator internus. The second portion lies behind this and is slightly overlapped by it. Both portions are inserted into tendon of obturator internus and into surface of bone just above it by tendinous fibres.

Gemellus inferior.—Arises from ascending ramus of ischium under cover of gemellus inferior and obturator internus. Inserted into digital fossa below tendon of obturator internus.

Biceps.—Coarsely fasciculated; arises from tuberosity of ischium; inserted into fascia on outer side of leg for its upper third.

Semitendinosus.—Arises from ischial tuberosity partly under cover of biceps and closely connected with it. An inch below its origin it receives caudal portion, which is ribbon-shaped and arises from transverse processes of second and third caudal vertebræ. At the junction of the two portions there is a tendinous intersection. It is inserted into inner surface of tibia under cover of gracilis, its lower part being closely connected with the insertion of that muscle. Its most superficial fibres are inserted into fascia on outer side of leg just below insertion of biceps.

Semimembranosus.—Arises from descending ramus of pubes and ascending ramus of ischium, extending between origins of gracilis and semitendinosus. It is inserted into inner side of head and adjacent part of tibia for two fifths of an inch.

Sartorius.—Arises from anterior superior spine of ilium and by a linear origin for a quarter of an inch below. It is inserted by tendon into expansion of triceps covering patella.

Triceps extensor.—Rectus femoris arises from dorsal part of acetabulum by a strong rounded tendon and by tendinous fibres above and below. Vastus externus and internus form a large fleshy mass arising from inner, anterior, and outer surfaces of femur. The former joins rectus for about a quarter of an inch and is inserted into front of knee, whilst vastus internus is inserted into fascia on inner side of knee.

Subcrureus.—A flat band arising from front of lower part of shaft of femur at its inner part. Inserted into inner surface of common tendon.

Psoas magnus.—A small thin muscle arising from last lumbar vertebra and anterior part of sacrum. It joins with iliacus at level of middle of sacrum, and is inserted by thin tendinous fibres into femur just below lesser trochanter.

Psoas parvus.—Very large, arising from sides of bodies of last three dorsal and first two lumbar vertebræ by tendinous fibres, and fronts of next four vertebræ by fleshy fibres. It is inserted by a narrow tendon into ilio-pectineal line just outside marsupial bone.

Iliacus.—Arises from iliac fossa. Inserted by muscular and tendinous fibres into lesser trochanter of femur and into surface of bone beneath it, its lower fibres being closely connected with tendon of psoas.

Gracilis.—Arises from lower two thirds of pubic symphysis and from a small portion of its descending ramus. It is inserted into inner surface of tibia by strong fibres at its upper part, and by a fascia closely united to lower part of insertion of semitendinosus below this.

Pectineus consists of two small flat slips united at their origin:—1. Arises from outer angle of base of marsupial bone by a narrow tendon. 2. Arises from pubes between former slip and insertion of psoas parvus. They are inserted into upper half of linea aspera superficial to adductor brevis, a narrow space existing between their insertions.

Adductor brevis.—Arises from a small portion of pubic symphysis, ascending ramus of pubes, and inner part of marsupial bone. It is inserted into middle lip of linea aspera for its upper half.

Adductor magnus.—Extensive origin from lower part of pubic symphysis, rami of pubes and ischium, and ischial tuberosity under cover of gracilis, semimembranosus, and semitendinosus. Its fibres converge and are inserted into triangular surface at lower third of linea aspera. The muscle has the appearance of being enfolded on itself, the fibres from the symphysis pubis and upper part of ramus forming a thin strap-like band which crosses the other fibres obliquely.

Adductor longus.—Arises from pubic symphysis between origins of adductors brevis and magnus. It is inserted into lower half of linea aspera and inner condyle.

Quadratus femoris.—Arises from ischial tuberosity. Inserted tween greater and lesser trochanters of femur.

Gastrocnemius internus.—Arises from posterior part of inner condyle of femur. Its tendon is grooved on its deep aspect and embraces tendon of gastrocnemius externus. It is inserted on outer side of posterior surface of os calcis.

Gastrocnemius externus.—Much larger than preceding muscle. It arises from external condyle of femur, receiving a band of fibres which arises from the sesamoid bone, which articulates with the head of the fibula. It forms a thick belly, which is partially separable into two parts, and is inserted into os calcis on inner side of gastrocnemius internus.

Plantaris.—Arises in close connection with gastrocnemius externus from sesamoid bone, passes under gastrocnemei, and is inserted into fascia on inner side of foot.

Popliteus.—Arises by narrow tendon from external condyle of femur. Inserted into posterior surface of tibia at its upper half.

Tibialis posticus.—Arises from inner part of posterior surface of shaft of fibula in its upper fifth, passes behind inner malleolus, and is inserted into inner and under surfaces of astragalus.

Flexor longus digitorum.—Arises from inner border of posterior surface of fibula at its upper third and from interosseous membrane. Tendon joins inner border of tendon of flexor longus pollicis.

Flexor longus pollicis.—Arises from whole of inner and posterior surfaces of fibula. The muscle is easily separable into two parts, the deep portion joining the tendon of the superficial in its lower fifth. The tendon divides into five slips, one of which passes to each of the toes. The tendon to the hallux comes off from the superficial part, and some of its fibres are directly continuous with those of the flexor longus digitorum. Four lumbricales are present, arising from single tendons and passing to tibial side of corresponding toe. The outer one is larger than the others.

Accessorius.—Arises from a ridge at outer border of lower surface of os calcis. It passes inwards and slightly forwards, and is chiefly inserted into tendon of flexor longus pollicis.

Tibialis anticus.—A large muscle, arising from upper two fifths of outer surface of shaft of tibia. It is inserted into inner side of internal cuneiform.

Extensor longus digitorum.—A small muscular belly, arising from inner side of ridge on anterior border of head of fibula. It divides into two tendons. Inner one again divides into three, which are inserted by two slips into bases of first phalanges of index, medius, and annularis. Outer tendon is similarly inserted into minimus. Tendon to annularis is connected by vinculæ to adjoining tendons.

Extensor longus pollicis.—Arises from upper half of shaft of fibula on its anterior aspect; passes obliquely to inner side of foot, and is inserted at base of first phalanx of great toe.

Peroneus longus arises by two heads:—1. From posterior part of head of fibula and sesamoid bone. 2. From outer part of prominent ridge on anterior border of fibula, and septum between it and peroneus brevis. Peroneus quinti digiti lies between its two heads. Its tendon passes behind external malleolus into sole of foot, and is inserted into outer angle of metacarpal of great toe.

Peroneus brevis.—Arises from anterior border of fibula just below prominent ridge and septa between it and peroneus longus and extensor longus digitorum. It is inserted into outer side of base of metacarpal of minimus.

Peroneus quinti digiti.—Arises from external condyle of femur and external lateral ligament. Its long tendon passes behind external malleolus to be inserted into outer side of first phalanx of minimus.

Peroneus quarti digiti.—Arises from upper third of anterior surface of fibula with exception of a small interval at top.

Peroneus tertii digiti.—A very slender muscular belly, arising from outer side of fibula just below outer head of peroneus longus. Of the arrangement of these last two muscles I am not certain. The former seemed in right foot to divide and to pass to outer sides of fourth and fifth toes, but in left foot I easily traced it to outer side of first phalanx of fourth toe. The latter muscle had an exceedingly slender tendon, which I traced in the right foot to the outer side of the third toe, but in the left foot I could not trace it beyond the fascia of the ankle. All the peronei tendons pass behind the malleolus.

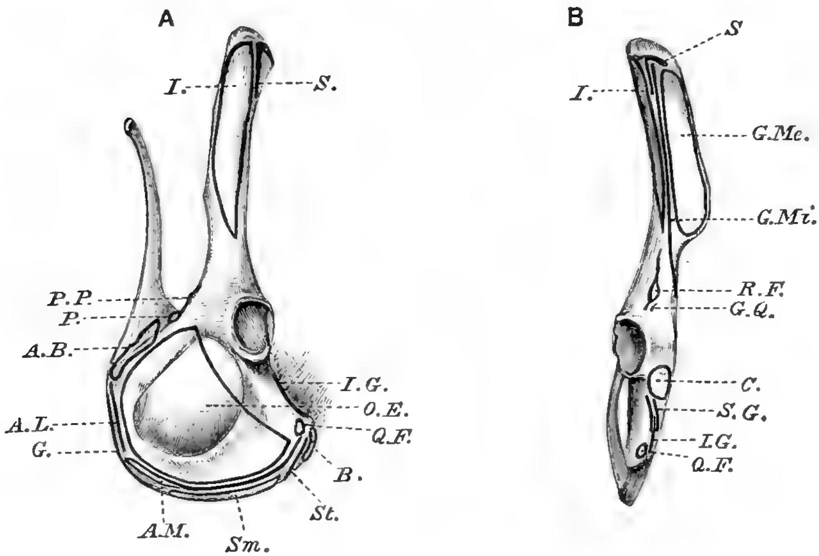
Extensor brevis digitorum.—Arises from outer side of ankle and apex of fibula. It divides into two (?) tendons, which pass to inner toes and form a tendinous expansion at metacarpo-phalangeal joint with tendon of long extensor.

Muscles of Foot.

Dorsal Layer.—*Abductor minimi digiti* consists of two parts—one arising from under surface of os calcis, the other from annular ligament; both are inserted into outer side of base of first phalanx of minimus.

Abductor ossis metatarsi minimi digiti.—Arises from under sur-

Fig. 4.



Myology of Water-Opossum.

I., iliacus; *S.*, sartorius; *P.P.*, psoas parvus; *P.*, pectineus; *A.B.*, adductor brevis; *A.L.*, adductor longus; *G.*, gracilis; *A.M.*, adductor magnus; *S.m.*, semimembranosus; *St.*, semitendinosus; *B.*, biceps; *Q.F.*, quadratus femoris; *O.E.*, obturator externus; *I.G.*, inferior gemellus; *G.Me.*, gluteus medius; *G.Mi.*, gluteus minimus; *G.Q.*, gluteus quartus; *R.F.*, rectus femoris; *C.*, coccygeus; *S.G.*, superior gemellus.

face of os calcis external to above. Inserted into outer side of base of metatarsal of minimus internal to insertion of peroneus brevis.

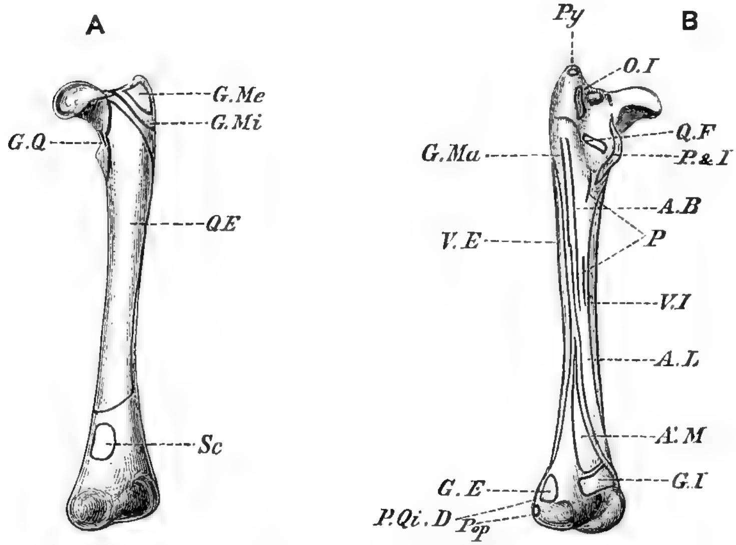
Abductor annularis.—Arises from base of metatarsal of minimus, cuboid, and sheath of peroneus longus; inserted into outer side of base of first phalanx of annularis.

Abductor indicis, from outer side of base of metatarsal of great toe to inner side of first phalanx of index.

Abductor pollicis.—Large, arising from tuberosity of scaphoid; inserted into inner side of first phalanx of pollex.

Intermediate layer.—Each consists of two bellies, which are more or less connected and inserted into bases of first phalanges.

Fig. 5.



Myology of Water-Opossum.

G.Me., gluteus medius; *G.Mi.*, gluteus minimus; *G.Q.*, gluteus quartus; *Q.E.*, quadriceps extensor; *Sc.*, subcrureus; *Py.*, pyriformis; *O.I.*, obturator internus; *Q.F.*, quadratus femoris; *P. & I.*, psoas and iliacus; *G.Ma.*, gluteus magnus; *A.B.*, adductor brevis; *P.*, pectineus; *V.E.*, vastus externus; *V.I.*, vastus internus; *A.L.*, adductor longus; *A.M.*, adductor magnus; *G.I.*, gastrocnemius internus; *G.E.*, gastrocnemius externus; *P.Qi.D.*, peroneus quinti digiti; *Pop.*, popliteus.

Flexor brevis minimi digiti.—Large, arising from base of metacarpal of minimus.

Flexor brevis annularis,—Arises from ridge on cuboid by a narrow tendon.

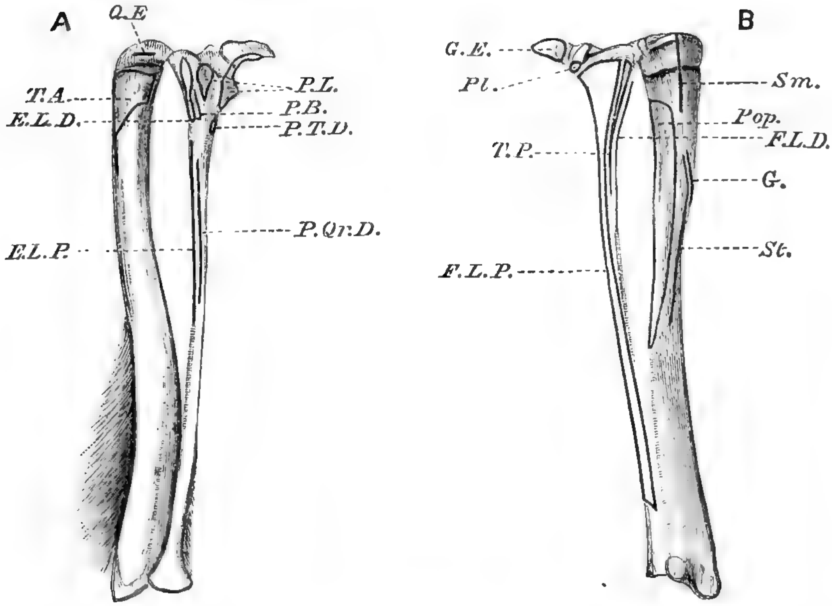
Flexor medii.—Inner part is connected with flexor indicis.

Fexor indicis.—Arises from cuneiform bones.

Flexor pollicis.—Arises from scaphoid.

Plantar Layer.—All arise from common tendon in sole. The muscles to pollex and minimus are large, the others being very small slips. The slips to pollex and index pass to outer side of phalanges. The slip to the minimus passes to the inner side; whilst the annularis has two slips—one passing to the inner side, and the other dividing, the greater part passing to outer side, whilst a small portion goes to inner side. There is also a flexor brevis digitorum which arises from os calcis.

Fig. 6.



Myology of Water-Opossum.

Q.E., quadriceps extensor; *T.A.*, tibialis anticus; *E.L.D.*, extensor longus digitorum; *E.L.P.*, extensor longus pollicis; *P.L.*, peroneus longus; *P.B.*, peroneus brevis; *P.T.D.*, peroneus tertii digiti; *P.Qr.D.*, peroneus quarti digiti; *G.E.*, gastrocnemius externus; *Pl.*, plantaris; *T.P.*, tibialis posticus; *F.L.P.*, flexor longus pollicis; *Sm.*, semimembranosus; *Pop.*, popliteus; *F.L.D.*, flexor longus digitorum; *G.*, gracilis; *St.*, semitendinosus.

Muscles of Head and Neck.

Masseter.—Enormously developed. Can be easily separated into several strata. The most superficial fibres arise from the strong masseteric fascia, and, passing inwards and backwards, are inserted into incurved portion of lower jaw.

The next fibres, which also pass backwards, arise from lower border of zygoma, and are inserted into a ridge, extending from condyle of lower jaw along lower border of outer surface. The most internal part arises from lower border and inner surface of zygoma, and its fibres, passing downwards and slightly forwards for the most part (the most anterior fibres passing slightly backwards), are inserted into outer surface of ramus between oblique line and dental foramen. The most posterior fibres of the superficial portion of the muscle are inserted into a tendinous raphe behind the ramus, which receives the most posterior fibres of internal pterygoid on its inner surface.

Temporal.—Consists of two easily separable laminæ. Superficial portion, thin in its posterior two thirds, arises from posterior part of inner surface of zygoma inseparable from masseter, and from a small portion of upper border of zygoma at its posterior part. These fibres chiefly converge to the anterior inferior angle of the muscle and form a large fleshy mass, which is inserted into anterior border and outer surface of coronoid process, whilst the posterior few fibres are inserted into outer surface of coronoid. The much larger deep part is separated from it by tendinous fibres. It arises from the whole of the temporal fossa and posterior part of inner surface of zygoma. It is inserted into inner surface and upper border of coronoid.

Internal pterygoid.—Arises from outer surface of pterygoid. Its fibres passing outwards, backwards, and slightly downwards, are inserted into border of incurved portion of lower jaw, its posterior fibres meeting those of masseter as described above.

External pterygoid.—A small roundish muscle, arising from pterygoid at upper and posterior part of internal pterygoid. Its fibres pass downwards and backwards, and are inserted into base of condyle of jaw.

Sterno-hyoid.—Long, ribbon-shaped, arising from inner surface of second piece of sternum ; inserted into front of hyoid.

Sterno-thyroid.—Smaller than preceding and overlain by it. Arises with sterno-hyoid, and is united with it for a short distance. United above with its fellow, and inserted with it into front of thyroid.

Thyroid hyoid.—Passes from side of thyroid to great cornu of hyoid.

Omo-hyoid.—A long narrow band arising from vertebral border of scapula. Inserted into hyoid, just external to sterno-hyoid. No tendinous intersection could be seen.

Mylo-hyoid.—Flat and thin, arising from posterior half of mylo-hyoid ridge of lower jaw. Inserted into median raphe, and its posterior fibres into tendinous expansion of posterior belly of digastric.

Genio-hyoid.—Narrow origin by tendinous fibres from inner border of lower jaw close to symphysis. It lies close to its fellow, and is inserted into front of hyoid. It sends a small muscular fasciculus to genio-hyoglossus.

Hyoglossus.—A large muscle extending from side of hyoid under cover of genio-hyoid. Its fibres pass forwards and inwards to be inserted into side of tongue for its posterior two thirds.

Genio-hyoglossus.—Arises from inner side of lower jaw close to middle line. Its fibres arch back to be inserted into posterior half of under surface of tongue and lower border of internal surface of hyoid, to which it is connected by tendinous fibres.

Digastric.—Posterior belly arises by a rounded tendon from par-occipital process. It forms a rounded belly which flattens out, forming a tendinous expansion which meets its fellow in middle line. Anterior belly arises from superficial aspect of this expansion, and forming a flat muscle, is inserted into lower border of lower jaw at its middle.

Paroccipito-hyoid.—A narrow band of fibres passing from paroccipital process, just internal to origin of posterior belly of digastric, to great cornu of hyoid.

A thin sheet of muscular fibres passes from basioccipital to great cornu of hyoid and pharynx, and a deeper set pass to side of tongue, side of hyoid, and pharynx.

Constrictor muscles form one sheet.

Scalenus posticus.—Arises by muscular fibres from third rib, interdigitating with serratus magnus. It passes forwards to be inserted by a small tendon into second cervical transverse process. It is closely connected with following muscle.

Scalenus anticus.—Arises from upper surface of first rib and is inserted by small tendons into second to sixth cervical transverse processes.

Trachelo-mastoid.—Arises from all cervical transverse processes; inserted into mastoid just behind cleido-mastoid. Tendinous intersection at its anterior fourth.

Complexus.—Arises from transverse processes as low as fourth dorsal; inserted into occiput. Tendinous intersection at its middle.

Splenius.—Arises from spinous processes of all cervical and first two dorsal vertebræ. Inserted into occipital crest and mastoid process under cover of trapezius and cleido-occipital. Its posterior fibres are continuous with serratus posticus superior.

Muscles of Trunk.

External oblique.—Arises by fleshy digitations from outer surfaces of third to thirteenth rib. Inserted into linea alba, tips and outer border of marsupial bone, and tendon, extending from anterior superior iliac spine to pubes just behind origin of pectineus.

Internal oblique.—Very thin ventrally, thicker dorsally. Arises from lumbar fascia and anterior part of iliac crest. Inserted into lower few ribs, becoming merged with lower intercostals, and into outer border of marsupial bone. Tendinous intersections continue the lower two ribs in this muscle for a short distance.

Transversalis.—Consists of very thin fibres. Separated from last muscle by intercostal nerves.

Pyramidalis.—Completely overlies rectus abdominis. Arises from inner border of marsupial bone by muscular fibres, and by tendinous fibres from its tip. The posterior fibres pass transversely inwards to linea alba, the upper fibres obliquely forwards, and those from tip of marsupial bone directly forwards to blend with rectus.

Rectus abdominis.—Arises from inner border of marsupial bone. Fibres pass directly forwards and are inserted into first rib close to sternum, and to sternum in first intercostal space. Only one intersection was noticed situated at level of ensiform appendix.

Serratus posticus superior.—Arises by fascia from all dorsal spinous processes excepting the last one. Inserted into third to twelfth ribs. Its anterior fibres are connected with splenius.

Serratus posticus inferior.—Arises by tendinous fibres from eleventh to thirteenth dorsal vertebræ and from lumbar vertebræ behind this. Inserted into tenth to thirteenth ribs. Its fibres overlie serratus superior and are continuous behind with internal oblique.

Triangularis sterni.—Extends from upper border of third piece of sternum to lower border of ensiform appendix, and is inserted into second to fifth ribs and upper border of sixth.

Coccygeus.—Arises from spine of ischium and surrounding portion of bone by tendinous fibres. It spreads out in a fan-like manner, and is inserted into transverse processes of 1–6 caudal vertebræ and into fascia behind this.

Agitator caudæ.—Arises from posterior margin of outer surface of iliac crest, and from fascia overlying elevator caudæ, which attaches it to the last few sacral vertebræ. It is attached to transverse processes of first ten caudal vertebræ.

Extensor caudæ.—A thick fleshy mass arising as far forwards as first lumbar vertebra. It divides into numerous fleshy bellies which overlie one another, and whose tendons pass to caudal vertebræ at a very variable distance.

Depressor caudæ.—A thick fleshy mass arising from front of sacrum and brim of pelvis, and from tendon of psoas parvus by a few fibres.

3. Description of a new Species of Frog from Asia Minor. By G. A. Boulenger, F.Z.S.

[Received November 21, 1884.]

(Plate III.)

A new species of *Rana*, belonging to the section *Ranæ temporariæ*, was discovered at Brusa by Baron von Maltzan, and a male specimen obtained for the Natural-History Museum through Dr. Aug. Müller of Frankfort. Its nearest ally is *Rana temporaria* (*R. fusca terrestris* of Rösel), from which it differs in the longer hind limbs, which equal those of *R. agilis*, the narrower interorbital space, the longer inner metatarsal tubercle, and also in a few points of minor importance. This Frog I propose to name

Rana macrocnemis, sp. n. (Plate III.)

Head broader than long; snout short, obtuse; loreal region not very oblique; nostril equally distant from the eye and the end of the snout; interorbital space flat, half the width of the upper eyelid; tympanum two thirds the diameter of the eye; the distance separating the eye from the tympanum equals nearly half the diameter of the latter. First finger longer than second, with strong swelling (♂) showing no trace of transverse division. Hind limb very long, the tibio-tarsal articulation reaching beyond the tip of the snout; tibia as long as the fore limb; toes three fourths webbed, with extremely small subarticular tubercles; inner metatarsal tubercle obtuse, elliptical, a

P. Smit del et lith. Mintern Bros. imp.

RANA MACROCNEMIS.

little more than half as long as the inner toe; a very distinct outer metatarsal tubercle. Skin slightly warty; glandular lateral fold not very prominent. Brown above, with blackish spots on the back and flanks; a canthal band, a large temporal spot, a streak bordering the upper lip, an elongate spot on the inner side of the humerus, a large V-shaped mark between the eyes, a Λ-shaped mark on suprascapular region, and regular cross bars on the limbs, blackish; lower surface whitish (in spirit), the sides of the throat dotted with blackish. Male with two internal vocal sacs.

The vomerine teeth, in the unique specimen, are rather indistinct, but resemble those of *R. temporaria*.

	millim.
From snout to vent	58
Head	20
Width of head	22
From eye to nostril	4
From nostril to end of snout	4
Diameter of the eye	6
Interorbital space	2·5
Diameter of the tympanum	4
From eye to tympanum	2
Fore limb	36
Hand	15
Hind limb	116
Tibia	36
Foot	33
First toe	6·5
Inner metatarsal tubercle	3·5

4. On five new Species of Shells of the Genus *Buliminus* from the Levant, collected by Vice-Admiral T. Spratt. By Dr. O. Boettger.

[Received December 4, 1884.]

The shells now described were collected under the same circumstances as those described by me in a former paper, published in the Society's 'Proceedings' for 1883 (p. 324).

1. Buliminus (Mastus) unius, n. sp.

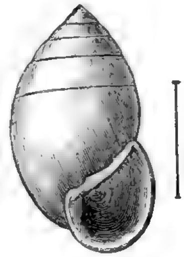
Char. *Differt a* Bul. pusio, *Brod., t. majore, anfr.* 6 *nec* 5½ *striatulis, striis ad suturam non impressis, apert. tuberculo angulari transverso distinctissimo instructa et columella distinctius plicato-torta.*

Alt. 13, *diam. min.* 7¼, *maj.* 8 *mm.; alt. apert.* 6½, *lat. apert.* 5½ *mm.*

Hab. Unia insulam.

Obs. Simillimus *Bul. (Mastus) pusio*, Brod., insularum Syra, Tino et Syphanto, sed ob tuberculum angulare distinctum gregi speciali *Bul. (Mastus) pupa*, Brug., adjungendus.

Fig. 1.

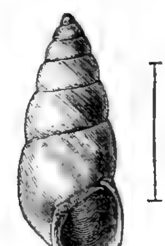


Buliminus unius.

2. Buliminus (Zebrina) cæsius, n. sp.

Statura Bul. dardani, *P., sed multo minor, colore* Bul. syriaci, *P.—T. profunde rimata, clavato-turrita, tenuis, cæruleo-alba, hic illic strigis punctisque griseis ornata, anfr. tribus superis corneo-luteis; spira cornico-turrita, ad latera vix convexa; apex modice acutus. Anfr.* 7–8 *perparum convexi, sæpe paululum subimbricati, sutura impressa submarginata disjuncti, irregulariter striatuli, striis valde obliquis, ultimus sub medio fere subangulatus, deorsum vix attenuatus, ad aperturam non*

Fig. 2.



Buliminus cæsius.

ascendens, $\frac{1}{3}$ *altitudinis æquans. Apert. ovata, intus dilute fuscula; perist. acutum, vix expansum, aut non aut vix remote sublabiatum, marginibus valde approximatis, callo tenuissimo junctis, dextro bene arcuato, columellari reflexiusculo; columella subtorta vel oblique subplicata.*

Alt. 15, *diam.* $5\frac{1}{2}$ *mm.; alt. apert.* $5\frac{1}{2}$, *lat. apert.* 4 *mm.* (Spratt).

Alt. $18\frac{4}{5}$, *diam.* $6\frac{2}{3}$ *mm.; alt. apert.* $6\frac{1}{2}$, *lat. apert.* $4\frac{2}{3}$ *mm.* (O. Goldfuss).

Hab. ? Græciam (*T. Spratt*); Smyrnam (*O. Goldfuss*).

Obs. Species nostra, sæpe pro *Bul. syriaco*, P., in collectionibus observanda, differt ab hoc spira exacte conico-turrita, perist. non expanso nec callose labiato.

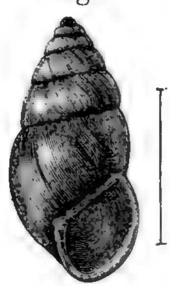
3. Buliminus (Mastus) milensis, n. sp.

Species e grege Bul. pusio, *Brod.*, *et* pseudogastrum, *Hesse, insulæ Syræ, nec non* etuberculati, *Frauenfld., insulæ Andri, sed his omnibus multo major, maxime cylindrata et minus distincte striata.—T. breviter sed profunde rimata, conico-oblonga, solidula, epidermide nitida, lutea, strigis obsoletis olivaceo-fuscis ornata induta ; spira convexo-conica ; apex acutiusculus. Anfr. 7 vix convexiusculi, sutura lineari, crenulata et fere submarginata disjuncti, obsolete striatuli, striis ad suturam paulo distinctioribus, ad basin hic illic spiraliter lineolati, ultimus* $\frac{2}{5}$ *altitudinis æquans. Apert. parva, truncato-ovalis, superne et inferne angulata ; perist. albolabiatum, marginibus late distantibus, callo distincto junctis, dextro longo, ad suturam breviter subsinuato, parum curvato, columellari brevi, subreflexo ; columella recta, planata. Tuberculum angulare nullum.*

Alt. $18\frac{1}{2}$, *diam. maj.* 8, *minor* $7\frac{1}{2}$ *mm.; alt. apert. fere* $7\frac{1}{4}$, *lat. apert.* $5\frac{1}{2}$ *mm.* (Spratt).

Hab. insulam Milo.

Fig. 3.



Buliminus milensis.

4. Buliminus (Ena) stokesi, n. sp.

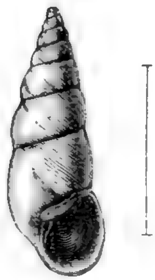
Char. *Species maxime aff.* Bul. caucasio, *Pfr., sed spira exacte turrita nec convexo-turrita, colore pallidiore, obsolete strigata.—T. breviter rimata, turrita, solidula, nitidula, corneo-albida, hic illic obscurius luteo strigata ; spira exacte turrita ; apex obtusus, obscurius luteus. Anfr.* 8 *convexiusculi, medii fere plani, lente accrescentes, sutura impressa submarginata disjuncti, striatuli, superiores pro latitudine testæ alti, ultimus major, basi tumidulus,* $\frac{2}{5}$ *altitudinis subæquans. Apert. subrecta, acuminato-ovata, faucibus fuscula ; perist. tenue, albolabiatum, marginibus subexpansis, dextro ad suturam parum arcuato, columellari subreflexo ; columella subconcava, superne sat distincte contortoplicata.*

Alt. $17\frac{1}{2}$, *diam. min.* $5\frac{3}{4}$, *maj.* 7 *mm.; alt. apert.* 6, *lat. apert.* 4 *mm.*

Hab. Amorgo insulam.

Obs. Specimen unicum solum vidi mortuum.

Fig. 4.

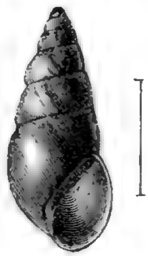


Buliminus stokesi.

5. Buliminus (Ena) carpathius, n. sp.

Char. *Differt a præcedente t. fere perforato-rimata, oblongo-turrita, corneo-lutea, hic illic fusculo strigata, spira convexo-turrita, anfr. 7 distincte convexioribus, celerius accrescentibus,*

Fig. 5.



Buliminus carpathius.

sutura magis impressa disjunctis, ruguloso-striatis, striis multo distinctioribus, apert. magis obliqua, late acuminato-ovata, perist. simplici, acuto, non labiato, margine columellari prope rimam reflexo, perforationem semitegente.

Alt. 14, *diam. min.* $4\frac{1}{2}$, *maj.* $5\frac{1}{2}$ *mm.; alt. apert.* 5, *lat. apert.* $3\frac{1}{2}$ *mm.*

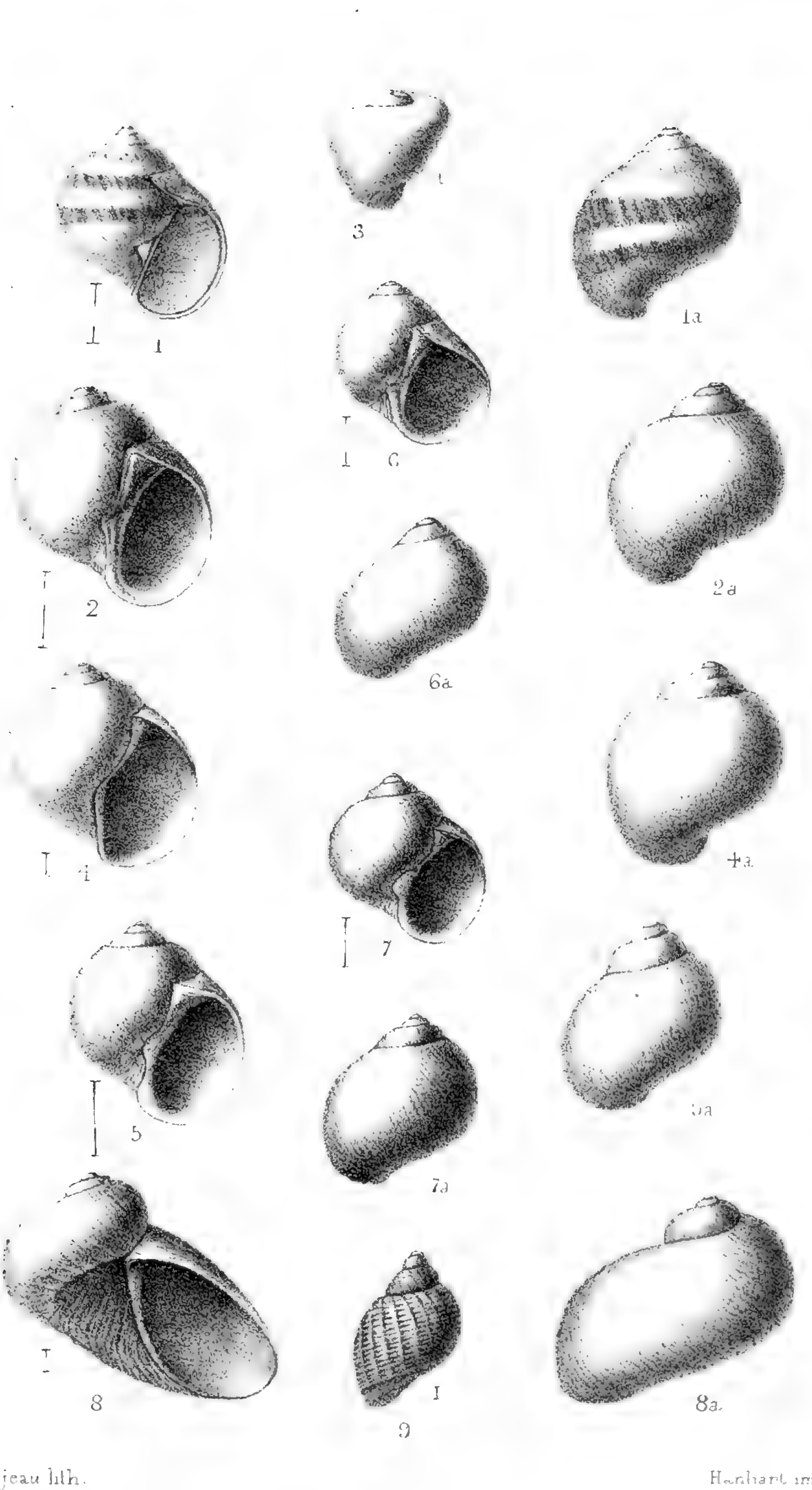
Hab. Karpatho insulam.

Obs. Affinis etiam *Bul.* (*Enæ*) *subtili,* Rssm., Cattaroensi, sed t. magis conico-turrita nec fusiformi-turrita et apert. nullomodo labiata.

5. On a new Land-Shell from the New Hebrides. By John H. Thomson, C.M.Z.S.

[Received December 5, 1884.]

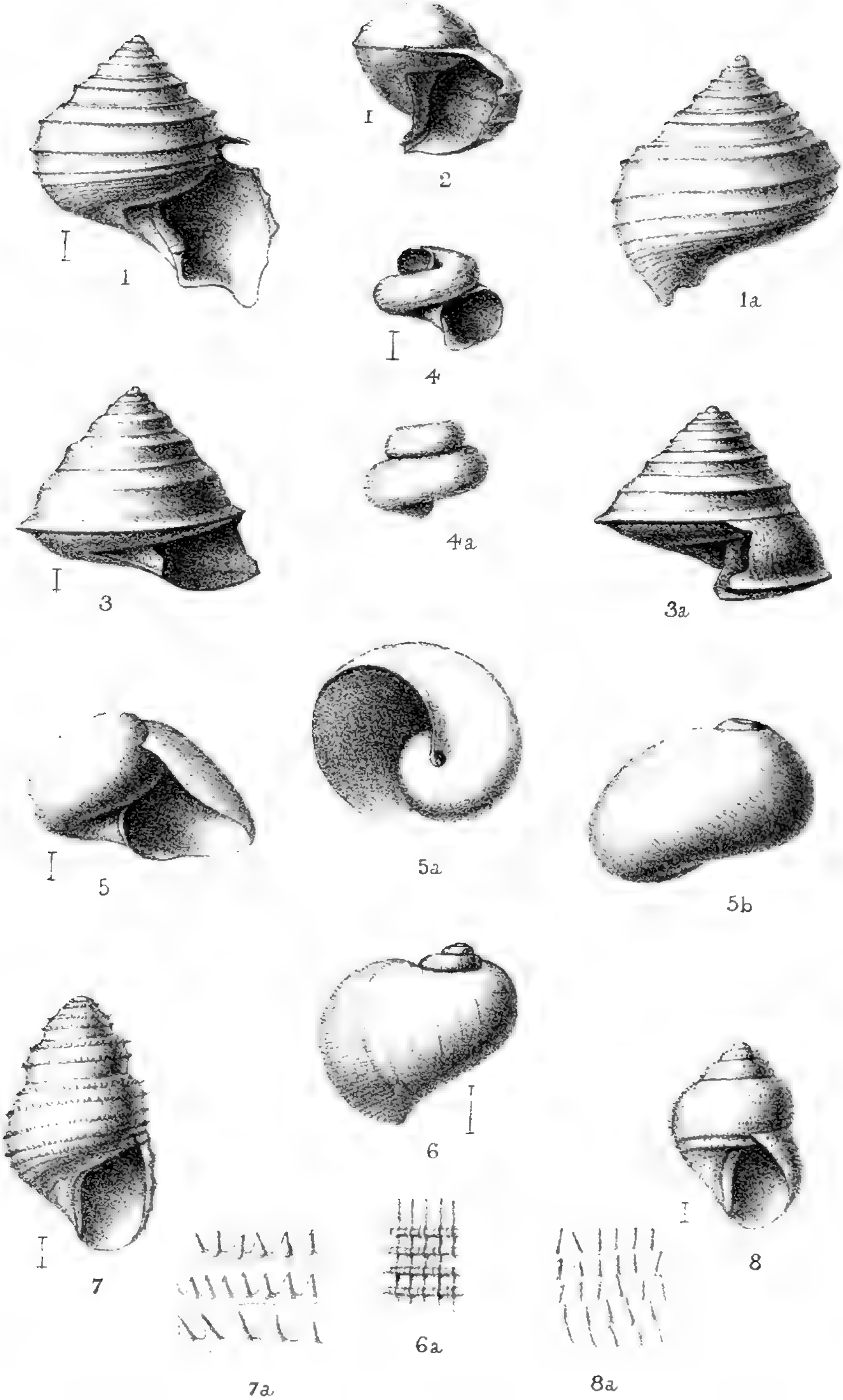
A shell, of which I can find no published description, was sent me in a package of rare shells collected on the island of Vate, New Hebrides, by Edgar Leopold Layard, Esq., F.Z.S., H.B.M. Consul at Noumea, New Caledonia. Its appearance is at first strikingly similar to that of the North-American *Hyalina arborea,* Say, except as regards



C. Berjeau lith.

Hanhart imp.

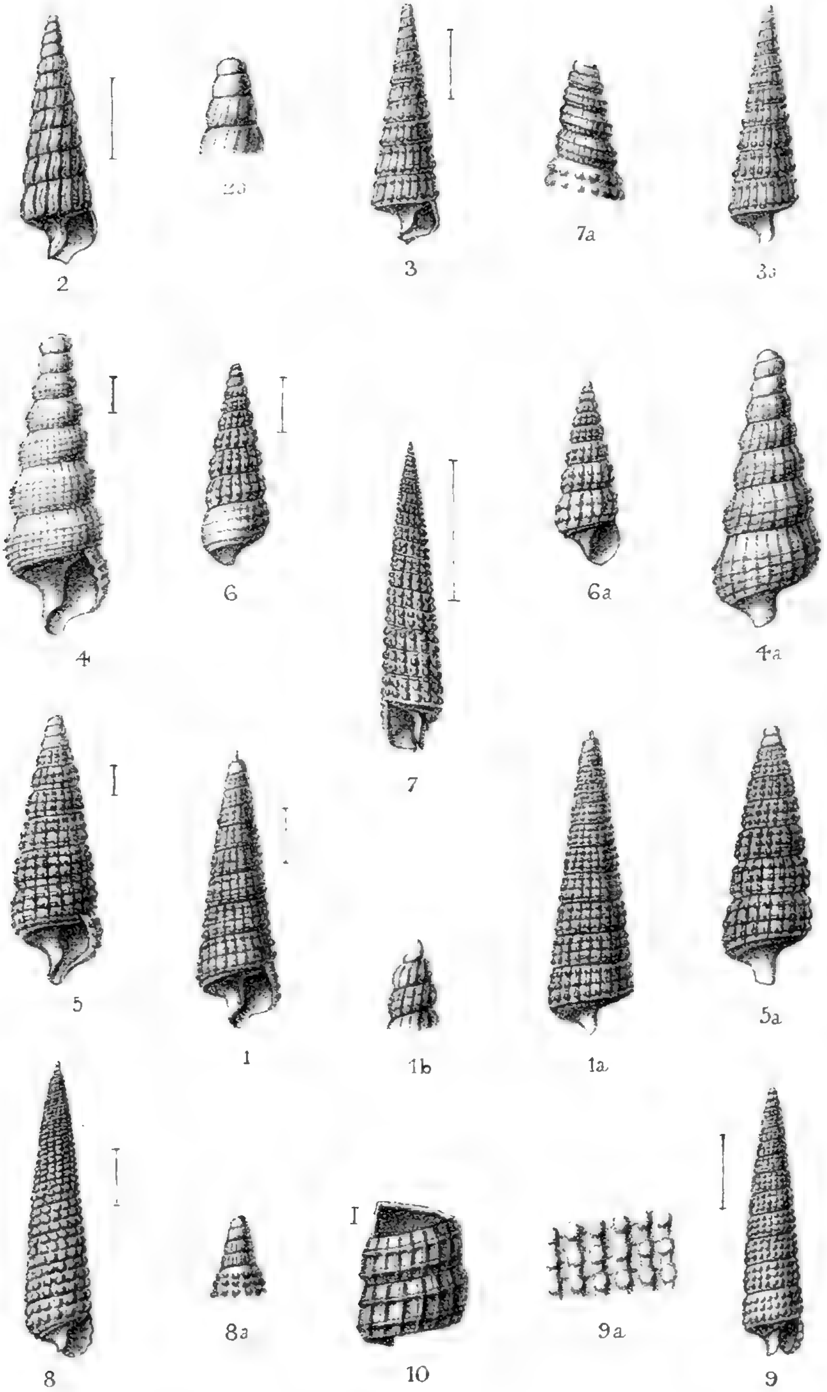
MOLLUSCA OF THE "LIGHTNING" AND "PORCUPINE" EXPEDITIONS



C. Berjeau lith.

Hanhart imp.

MOLLUSCA OF THE "LIGHTNING" AND "PORCUPINE" EXPEDITIONS.

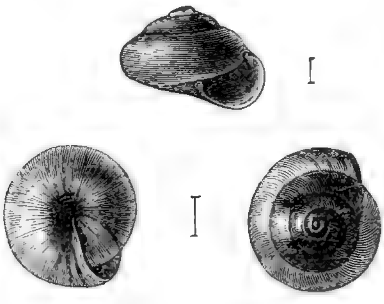


C. Berjeau lith.

Hanhart imp.

MOLLUSCA OF "THE LIGHTNING" AND "PORCUPINE" EXPEDITIONS.

the apparent absence of incremental striæ, which are only observable with a lens. On the base this similarity is at once lost through the small, almost microscopical umbilicus and its convex form. The species belongs to the section *Conulus* of Fitzinger, and may be described as follows:—



Hyalina layardi.

HYALINA (CONULUS) LAYARDI, sp. n.

Testa vix perforata, orbiculato-pyramidata, tenuis, superne sub-lente vix striatula, inferne distinctius striata, oleoso-nitens, corneo-lutea, sutura impressa; anfractus 5, *convexiusculi; ultimus rotundatus, antice non descendens, subtus convexus; apertura verticalis; perist. simplex, marginibus callo tenui junctis, basali convexo, subexcavato columellari vix reflexiusculo.*

Diam. maj. 5, *min.* $4\frac{1}{2}$, *axis* 3 *mm.*

Hab. Vate Island, New Hebrides. Coll. E. L. Layard and J. H. Thomson.

6. On the Mollusca procured during the 'Lightning' and 'Porcupine' Expeditions, 1868–70. (Part IX.[1]) By the late J. GWYN JEFFREYS, LL.D., F.R.S., F.Z.S.[2]

[Received January 13, 1885.]

(Plates IV., V., VI.)

GASTROPODA (*continued*).

Family XIX. IANTHINIDÆ.

1. IANTHINA EXIGUA, Bruguière, Encycl. Méthod. pl. 456. f. 2, *a*, *b*; Reeve, Conch. Icon. *Ianthina*, pl. v. f. 21, *a*, *b*: B. C. iv. p. 188.

[1] For Part I. see P. Z. S. 1878, p. 393; for Part II. see P. Z. S. 1879, p. 553; for Part III. see P. Z. S. 1881, p. 693; for Part IV. see P. Z. S. 1881, p. 922; for Part V. see P. Z. S. 1882, p. 656; for Part VI. see P. Z. S. 1883, p. 87; for Part VII. see P. Z. S. 1884, p. 111; and for Part VIII. see P. Z. S. 1884, p. 341.

[2] [Dr. Jeffreys died suddenly on January 24, 1885, four days after the reading of his paper at the Society's Meeting. By the request of his family I have undertaken to see my much lamented friend's manuscript through the press, but I would wish it to be understood that I do not therefore subscribe to the views and determinations given therein.—EDGAR A. SMITH.]

'Porcupine' Exp. 1870: Atl. St. 3, 6, 13, 16, 17, 17*a*, 22, 24, 25, 27, 28, 28*a*; Med. 55.

Distribution. Almost everywhere throughout the Atlantic and Pacific, but especially in the southern parts of those oceans. All the species of this remarkable genus are "waifs and strays," and have no local or fixed place of abode. Like the Heteropods and Pteropods, they inhabit the surface of the sea; and being entirely at the mercy of the wind and waves, they are drifted hither and thither and are occasionally thrown ashore as far north as Caithness and Donegal on our own coasts, but not further northwards.

I am not aware that any species of *Ianthina* has been recorded as fossil. Did the Equatorial or any similar marine current exist in the Pliocene or previous periods?

The apex of the present and other species is styliform, and apparently rudimentary or adapted to the embryonic stage of the animal. I may observe that although the food of the *Ianthina* is well known (see 'British Conchology,' vol. iv. p. 182), M. Henri Drouet, in his treatise on the 'Mollusques marins des Iles Açores,' seems to have considered it herbivorous, when he mentions having often seen it floating in a reversed position, "en attendant sans doute la rencontre de quelque plante." Tasli graphically described its occurrence on the shores of Brittany, "où quelquefois elles dessinent un ruban du plus beau bleu de plusieurs kilomètres de longueur." With respect to the animal of *Ianthina*, d'Orbigny says, in his work on the Mollusca of the Canary Isles collected by Webb and Berthelot, "Cette bouche est munie latéralement de tentacules coniques portant les yeux à leur base externe." The Messrs. Adams state as to all the members of this family, "Tentacles short and obtuse, with pointed eye-pedicels at their bases, but without any trace of eyes;" and they describe the *Ianthinidæ* as "blind." It is scarcely creditable that this simple question should not have been long ago determined and set at rest.

2. IANTHINA ROTUNDATA, Dillwyn.

I. rotundata (Leach, MS.), Dillw. Contrib. towards a History of Swansea (1840), p. 59: B. C. iv. p. 186, frontispiece and pl. iii. f. 1; v. p. 214, pl. lxxvii. f. 1.

'Porcupine' Exp. 1869: St. 47. 1870: Atl. 16 (fragments).

Distribution. British seas as well as the north-west of France, and Arcachon. Living specimens with the float attached were found by me more than half a century ago in Oxwich Bay near Swansea, by Miss Hockin at Hayle in Cornwall, and by the late Dr. Battersby in the west of Ireland. Shells of *I. communis* have also been found on our western coasts. Both of these species have several synonyms; but as one of the objects of the present work is to serve as a further Supplement to 'British Conchology,' I will not repeat any of the synonyms which I have already given for our native Mollusca.

Family XX. NATICIDÆ.

A. Operculum chitinous or horny. *Natica*, Risso.

1. NATICA SORDIDA, Phil. Moll. Sic. ii. p. 139, t. xxiv. f. 15: B. C. iv. p. 218; v. p. 215, pl. lxxviii. f. 3.

'Porcupine' Exp. 1869: St. 1, Dingle B., 6, 7, 9, 11, 13–16, 23, 45, 45*a*. 1870: Atl. 2, 3, 3*a*, 9–11, 13, Setubal B., 24, off C. Sagres, 26–30, 36; Med. C. de Gata, 45, 50, off Jijeli, 55, Benzert Road, Rasel Amoush, off Rinaldo's Chair, Adventure Bank.

Distribution. British coasts from Shetland to Devon, Denmark, Ostend? (*Malzine*), Bay of Biscay, N. Spain, S.W. France, throughout the Mediterranean and Adriatic, and off Madeira; 7–488 fms.

Fossil. Pliocene: Red and Coralline Crags, St. Erth, Cornwall, Middle and South of Italy. Post-tertiary: Caithness, Lancashire, and Cheshire.

Synonyms numerous. Judging from De Blainville's short description of *N. fusca* in the 'Dictionnaire des Sciences Naturelles,' I suspect that it was a reddish-brown and uniformly coloured variety of *N. millepunctata*. The present species may have been *N. lævida* of Laskey, or possibly the problematical *N. castanea* of Lamarck, which has been assigned to so many French species. Deshayes considered Lamarck's species to be a variety of his *N. monilifera*, our *N. catena*. On the whole it may be better to retain the well-known name of *sordida*, instead of wearying conchologists by a further and perplexed discussion as to the priority and appropriateness of the several other names which have been bestowed by different writers on this rather common and extensively distributed species. The *N. sordida* of Swainson appears to have been *N. plumbea* of Lamarck.

2. NATICA PALLIDA, Broderip and Sowerby.

N. pallida, Brod. & Sow. in Zool. Journ. vol. iv. (1828–29), p. 372.
N. grœnlandica, B. C. iv. p. 216; v. p. 215, pl. lxxviii. f. 2.

'Porcupine' Exp. 1869; St. 14, 45, 58.

Distribution. Arctic seas in both hemispheres, Iceland, Faroe I., Scandinavia, Great Britain southwards to the Dogger Bank, Labrador, Canada, and New England, N. Japan, ? Ostend (*Malzine*); 2–1290 fms.

Fossil. Pliocene? and Post-tertiary: Red and Norwich Crags, Siberia (*Schmidt*), Iceland (*Mörch*), Norway and Sweden, British Isles, Labrador, Canada and New England; 0–400 ft.

Synonyms. N. pusilla, Gould (not Say), *N. livida*, Bean, *N. borealis* and perhaps *N. suturalis*, Gray, *N. grœnlandica* (Beck), Möller, probably *N. beverlii*, Leach, *N. gouldii*, Philippi, *N. alba* and *N. lactea* (Lovén MS.), Philippi, and *N. bulbosa*, Reeve. I have given this long list of names to show the confusion and difficulty which is so apt to perplex students when trusting to certain works. Philippi has, in Küster's edition of the 'Conchylien Cabinet,' mistaken, as well as Forbes and Hanley, the present species for *N. pusilla* of Say, which has a calcareous operculum. I was at one time inclined to doubt whether *N. pallida* of Broderip and Sowerby might not be *N. islandica*: but I have now satisfied myself, by the further examination of numerous specimens from the North Atlantic and Pacific oceans, that *N. grœnlandica* is sufficiently represented by their description although short, which is as follows:—

"*Natica pallida.* N. testâ subglobosâ, albidâ, tenui, apice breviter acuminato, eroso; anfractibus rotundatis, margine elevatiusculo, suturâ distinctâ; umbilico parvo; long. $1\frac{3}{20}$, lat. 1 poll.

Hab. in Oceano Arctico." From Icy Cape.

Specimens from the arctic seas are much larger than those from the Dogger Bank.

3. Natica macilenta, Philippi.

N. macilenta, Phil. Moll. Sic. ii. p. 140, t. xxiv. f. 14.

'Porcupine' Exp. 1870: Med. St. Algesiras B., Capo de Gata, 50, 55, G. Bona, Benzert Road, Rasel Amoush, G. Tunis, Adventure Bank (and var. *alba*).

Distribution. Throughout the Mediterranean and Adriatic, Mogador (*McAndrew*)!

Fossil. Pliocene: Biot, Italy, and Rhodes.

Probably *N. pulchella* of Risso; but his descriptions are very insufficient to identify any species. The present species comes near *N. guillemini* of Payraudeau, and may be a variety of it: the latter differs only in its less oval shape and being of a larger size. *N. rizzæ* of Philippi appears to be a variety of his *N. macilenta*. If all these species are the same Payraudeau's name has priority over both of Philippi's species, although it is posterior to that of Risso.

4. Natica glaucina, Linné.

N. glaucina, L. Fauna Suecica, ed. 2, p. 533, no. 2197.

N. alderi, B. C. iv. p. 224; v. p. 215, pl. lxxviii. f. 5.

'Porcupine' Exp. 1869: St. 1, 2, 3, 12, 14, 17, 18, 23 *a* (and var. *lactea*), L. Swilly, L. Foyle, 33, 35, off Lerwick. 1870: Atl. Vigo B., Tangier B.; Med. Algesiras B., Benzert Road.

Distribution. Loffoden I. to the Mediterranean and Adriatic: 2–310 fms.

Fossil. Pliocene: Red Crag, Tuscany, Calabria. Post-tertiary: Scandinavia, British Isles, and Messina.

As a mere act of justice to the illustrious Swede, I feel myself compelled to substitute for *alderi* the specific name *glaucina*, by which he originally and undoubtedly designated and so fully described this common European shell in his 'Fauna Suecica,' and which he afterwards countersigned or sufficiently indicated in the twelfth edition of the 'Systema Naturæ.' When I was tempted to adopt the name given by Professor Forbes in honour of Mr. Alder (both of them my old and lost friends!), I was misled by the long and perplexing discussion of the Linnean species in Mr. Hanley's work. Reeve followed Forbes and Hanley and older British authors in referring the present species to *N. nitida* of Donovan (a West-Indian shell); but he described and figured under that name and as our species *N. guillemini* of Payraudeau. His errors of nomenclature are very bewildering.

5. NATICA INTRICATA, Donovan.

N. intricata, Don. Brit. Shells, v. t. 167; Hidalgo, Moll. mar. Esp. lam. 20A. f. 8–10, 9 (opt.).

'Porcupine' Exp. 1870: Tangier B.

Distribution. Portugal and Azores (*McAndrew*), throughout the Mediterranean and Adriatic; 2–120 fms.

Fossil. Pliocene: Tuscany, Monte Mario, Calabria, Sicily, and (?) Rhodes. Post-tertiary: Militello, in tufo balsatico (*Philippi*).

This is (partly) *Nerita canrena* of Linné, *Natica marmorata,* Risso, *N. valenciennesi*, Payraudeau.

6. NATICA MONTACUTI, (*montagui*) Forbes.

N. montagui, Forb. Mal. Mon. p. 32, pl. ii. f. 3, 4.

N. montacuti, B. C. iv. p. 227; v. p. 215, pl. lxxviii. f. 6.

'Lightning' Exp.: St. 5, 6, 7.

'Porcupine' Exp. 1869: 1, 2, 3, 6, 9, 13, 14, 23*a*, 25, 36, 41, 47, 68, 70, 89, Little Minch. 1870: Atl. (var. *minor*), 3, 3*a*, 9, 30; Med. C. de Gata, Adventure Bank.

Distribution. Iceland, Finmark to Guernsey, Belgium (*Malzine*); 5–570 fms.

Fossil. Post-tertiary: Christiania and Bohuslän, Hebrides, Bridlington, Calabria, Sicily, and Rhodes.

7. NATICA NOTABILIS[1], Jeffreys. (Plate IV. figs. 1, 1 *a.*)

SHELL globosely fusiform (being pointed at the apex and base), thick, opaque, rather glossy: *sculpture,* none except irregular lines of growth: *colour* yellowish-white, with three equidistant bands on the body-whorl, composed of reddish-brown streaks, which are close-set and obliquely arranged; one of these bands encircles the middle and is broader than the others, the upper one lies just below the suture, and the third or lowermost is placed below the periphery; there is also a small blotch of the same colour above the umbilical pad: *spire* short, but prominent and pointed: *whorls* 5, convex, compressed at the top; the last occupies $\frac{8}{10}$ of the spire: *suture* slight, but distinct, not channelled: *mouth* semilunar, equal in length to $\frac{4}{7}$ of the spire: *outer lip* thin, curved but not inflected at the top: *inner lip* narrowly spread on the upper part and thickened at the base: *umbilicus* contracted by a thick but small pad, so as to form a crescentic groove: *operculum* chitinous, ear-shaped, horn-colour, indistinctly striated in the line of growth, and having a small lateral spire of three whorls, defined by an overlapping and raised edge. L. 0·4, B. 0·35.

[1] Remarkable.

'Porcupine' Exp. 1870: Atl. St. C. Sagres. A single but living specimen.

This pretty species resembles in the coloured bands the well-known *N. triseriata* of Say; but the whorls are not so ventricose in the present species, the spire is more pointed, and the umbilicus differs in having a small semicircular pad covering more than half of it. The suture in the present species is not excavated as in *N. montacuti*, and the spire is shorter and also more pointed. It differs from *N. macilenta* and its probable variety *N. rizzæ*, in shape, consistence, colour, and umbilicus.

Professor G. O. Sars has very kindly examined for me the odontophores of the present species and *N. triseriata*. He finds that the conchological difference of the two species is also well marked in the structure of their respective radulæ. "The middle plate is especially different. In *N. notabilis* the middle tooth is unusually small, and by no means equals the size of the lateral teeth. In *N. triseriata* the middle plate is rather large and has the middle tooth much larger and more prominent than the lateral teeth. The shape of the plate in each is also different. Moreover the jaws in *N. notabilis* appear to be much coarser in structure, and the whole radula is also comparatively longer. In both species the inner uncinus exhibits the secondary tooth characteristic of the genus (or subgenus) *Lunatia*."

8. Natica subplicata[1], Jeffreys. (Plate IV. figs. 2, 2 *a*.)

Shell globular or inclined to oval, rather thick, opaque, and glossy: *sculpture*, numerous but short and irregular, oblique, longitudinal puckers or wrinkles below the suture of the body-whorl, and the rest of the shell is slightly striated in the same direction: *colour* ivory-white: *spire* short, apex pointed: *whorls* 5, tumid; the last occupies $\frac{7}{8}$ of the spire in length: *suture* deepish: *mouth* triangularly oval, pointed above and rounded below, equal in length to $\frac{3}{4}$ of the spire: *outer lip* gently curved and thick-edged: *inner lip* forming a narrow and nearly even glaze over the whole of the pillar: *umbilicus* small, ending below in a broadish groove: *operculum* horny, yellowish. L. 0·4, B. 0·35.

'Porcupine' Exp. 1870: St. 1, 2, 3, 9, 13, 17*a*, C. Espichel, 22, 26, 30.

Distribution. Bay of Biscay ('Travailleur' Exp.), off C. Verd I. ('Talisman' Exp.); 370–1192 fms.

Differs from other species now described or noticed in respect of the peculiar folds below the suture.

9. Natica angulata[2], Jeffreys. (Plate IV. fig. 3.)

Shell solid, with a flattened spire and a sharp angular keel on the periphery; whorls 2–3; suture deep; umbilicus small. L. 0·05, B. 0·075.

'Porcupine' Exp. 1869: St. 4. 1870: Atl. 30; Med. 55.

All the specimens are very small; but I cannot identify them

[1] Plicated underneath the suture. [2] Angular.

with the young of any other species known to me, and I have therefore named and characterized this species provisionally.

10. NATICA GLOBOSA[1], Jeffreys. (Plate IV. figs. 4, 4 *a*.)

SHELL globular, thin and fragile, semitransparent, and glossy: *sculpture*, only some slight and close-set spiral striæ which may be seen under a microscope: *colour* white with a faint tinge of yellowish-brown: *spire* short and pointed: *whorls* 4, tumid and compact; the largest occupies $\frac{3}{4}$ of the spire: *suture* rather deep: *mouth* oval, somewhat expanded, contracted and angular above, rounded below: *outer lip* nearly semicircular, thin-edged: *inner lip* narrow, flexuous, attached above to the pillar, and folded over the *umbilicus*, which consists of a narrow slit. L. 0·1, B. 0·075.

'Porcupine' Exp. 1870: Atl. St. 16, 17*a*; Med. 55.

Distribution. Marocco and C. Verd I. ('Talisman' Exp.); 1192–1980 fms.

B. Umbilicus more or less covered by a callus.
Neverita, Risso.

11. NATICA COMPACTA[2], Jeffreys. (Plate IV. figs. 5, 5 *a*.)

SHELL globular, thick, opaque, somewhat glossy: *sculpture*, a few microscopical spiral striæ, which are chiefly perceptible on the base: *colour* light yellowish-brown: *spire* short, turreted; apex blunt: *whorls* 4, convex, rapidly enlarging, shouldered below the suture; the last occupies $\frac{4}{5}$ of the spire: *suture* wide, slightly channelled: *mouth* oval, equal in length to $\frac{2}{3}$ of the spire: *outer lip* inflected above: *inner lip* thickened on the pillar and at the base, not forming a pad as in many of the other species: *umbilicus* concealed or closed by the inner lip. L. 0·35, B. 0·3.

'Lightning' Exp.: St. 7.

'Porcupine' Exp. 1869: 23, 23 *a*, 30. 1870: Atl. 16, 17, 17 *a*.

Differs from *N. montacuti* in having a turreted spire, and especially in the closed umbilicus. The very young are shaped like the adult, but the umbilicus is open and free in consequence of the inner lip not having been yet formed and spread over the pillar.

12. NATICA OBTUSA[3], Jeffreys. (Plate IV. figs. 6, 6*a*.)

SHELL oval, with an oblique outline, rather thick, opaque, and glossy in the living state: *sculpture*, slight and curved striæ in the line of growth, which are stronger below the suture in each whorl: *colour* whitish: *spire* short, apex very blunt: *whorls* 4, somewhat compressed, but not flattened; the last occupies $\frac{7}{8}$ of the spire: *suture* slight and shallow: *mouth* oval, acutely angulated above: *outer lip* thick-edged: *inner lip* thickened in the only adult specimen, and completely covering the umbilicus, which is partly visible in a half-grown specimen. L. 0·3, B. 0·3.

'Porcupine' Exp. 1870: Atl. St. 16, 17.

[1] Globular. [2] Compact together. [3] Blunt.

Two dead specimens, one larger than the other, and apparently full-grown.

Closely resembling in the shape and spire *N. immaculata* of Totten, a native of the eastern coasts of North America; but in that species the umbilicus is open and exposed. Query as to the scientific value of this character, except in adult specimens?

13. Natica nana, Möller.

N. nana, Möll. Ind. Moll. Grönl. p. 7.

Lunatia nana, G. O. Sars, Moll. reg. arct. Norv. p. 159, t. 21. f. 16, *a, b*.

'Porcupine' Exp. 1869: St. The Minch. Two dead specimens.

Distribution. Spitzbergen (*Torell* and 'Vöringen' Exp.), Vadsö, (*G. O. Sars*), Greenland (*Möller*), New England (*Verrill*), G. St. Lawrence (*Whiteaves*), Aleutian I. (*Dall*); 10–430 fms.

Specimens from Spitzbergen and Greenland differ as to the relative height or prominence of the spire; but the inner lip and umbilical pad seem to offer constant characters.

14. Natica josephinia, Risso.

Neverita josephinia, Risso, Eur. mér. p. 149. f. 43 (1826).

'Porcupine' Exp. 1870: Med. St. 50, 55, Benzert Road, Adventure Bank.

Distribution. Cadiz (*Paz, f. Hidalgo*), and throughout the Mediterranean and Adriatic; 4–10 fms.

Fossil. Miocene, Pliocene, and Post-tertiary: from Belgium to Sicily and the Morea, Rhodes and Cyprus.

Natica olla of Marcel de Serres, 1829.

The young of this, as well as of the next species, has its peculiar and characteristic inner lip or callus.

C. Operculum calcareous. *Nacca*, Risso.

15. Natica operculata [1], Jeffreys. (Plate IV. figs. 7, 7 *a*.)

Shell globular, thick, opaque, glossy: *sculpture*, merely lines of growth: *colour* white with a tinge of yellow: *spire* short; apex blunt and flattened: *whorls* 4–5, convex, the last occupies $\frac{5}{6}$ of the spire: *suture* slight, but wide in consequence of the upper part of each whorl being compressed and shouldered: *mouth* oval: *outer lip* thick-edged, somewhat expanding, extending beyond the upper opening of the mouth, and angulated in that part, round below: *inner lip* completely lining the base, and forming in the middle a semicircular pad, which is separated and defined by a narrow furrow or groove: *umbilicus* rather concave unless where it is closed near the pillar by the pad. L. 0·3, B. 0·275. A fragment of one specimen indicates a somewhat larger size.

[1] Covered with a lid.

'Porcupine' Exp. 1870: Atl. St. 24, 27, 28, 28 *a*, 30; Med. Adventure Bank.

Distribution. North Japan (*St. John*)!

This species may be known by the flattened apex and the remarkable semicircular pad on the umbilicus, which is proportionally much smaller than in *N. josephinia.* It is possible, however, that the present species may be a southern, and therefore a smaller, form or variety of *N. affinis.* The operculum in the Japanese specimens is calcareous. It is also possible that my *N. spheroides* from the 'Valorous' Expedition (1750 fathoms) may be the young of the present species.

16. NATICA AFFINIS, Gmelin.

Nerita affinis, Gmel. ed. L. S. N. p. 3675 (ex Müll. Zool. Dan. Prodr. no. 2956).

Natica affinis, B. C. iv. p. 229; v. p. 215, pl. cii. f. 3; G. O. Sars, Moll. reg. arct. Norv. p. 159, t. 21. f. 14 *a*, 14 *b*.

'Lightning' Exp. St. 5.

'Porcupine' Exp. 1869: St. 39, 65, 89.

Distribution. Circumpolar and arctic seas in the Atlantic and the Pacific, Iceland, Faroe Isles, between the Hebrides and Faroes, Norway, Labrador, Gulf of St. Lawrence, New England, Siberia, Sea of Okhotsk, Aleutian I. (*Dall*), North Japan (*v. Schrenck and Lindholm*); 1–1255 fms.

Fossil. Pliocene: Red Crag (*S. V. Wood*). Post-tertiary: Glacial beds in Greenland, Siberia, Iceland, Scandinavia, British Isles, Palermo (*Dr. van Geuns*), Russia, and N. America; 0–1360 ft. The difference of level in Great Britain extends to 1840 ft., viz. from the Shetland sea-bed, 480 ft., to Moel Tryfaen, 1360 ft.

Synonyms. N. clausa, Broderip and Sowerby; *N. septentrionalis* (Beck), Möller; and as a variety, *N. occlusa* of S. V. Wood and *N. russa* of Stimpson. Prof. G. O. Sars considers *N. affinis* and *N. clausa* distinct species, chiefly because of a difference in size and in the radula. But in his figure of the larger form, which he names *clausa* (t. 21. f. 12 *b*), the umbilicus is shown as quite open and without any callosity. It has been said that even the good Homer occasionally becomes sleepy! The present species is not *N. affinis* of Von d. Busch.

The animals or soft parts of the typical form and the variety *occlusa* or *russa* were described by me in my notices of the 'Valorous' Expedition. A specimen of the former is an inch and three tenths long, and nearly as broad. As to the greater size of Invertebrata from Arctic seas, Mr. Norman remarks, in his "Notes on the Oceanic Copepoda from Nares's Arctic Voyage:"—"With respect to size, we find here, as in so many other instances among the Invertebrata, an extraordinary development of the Arctic specimens, which are at least *six times* the size of those from the Irish coast, and measure five millimetres in length, exclusive of the antennæ."

17. NATICA FLAMMULATA, Requien.

N. flammulata, Req. Cat. Coq. Corse (1848), p. 61.

N. sagraiana, Hidalgo, Mol. mar. de Esp. lam. 26 A. f. 5–7 (opt.).

'Porcupine' Exp. 1870: Atl. St. off C. Sagres, Tangier B.; Med. Cartagena B., 50, 50 *a*, Benzert Road, Rasel Amoush, Adventure Bank.

Distribution. Gulf of Gascony, Cadiz, throughout the Mediterranean, Cuba, Madeira and Canaries; 20–120 fms.

Fossil. Pliocene: Calabria and Sicily.

N. filosa, Philippi (1852), but not of Reeve, *N. sagraiana*, d'Orbigny (1854), and perhaps *Nacca fulminea* of Risso, but not *Nerita fulminea* of Gmelin.

The specific name ought strictly to be *flammula* or *flammeola*, instead of *flammulata*, which is not a Latin word.

18. NATICA MARMORATA, H. Adams.

N. marmorata, H. Adams, in Proc. Zool. Soc. 1869, p. 274, pl. xix. f. 8.

N. prietoi, Hidalgo, Mol. mar. de Esp. lam. 20 B. f. 2, 3 (opt.).

'Porcupine' Exp. 1870: Med. St. Cartagena B.

Distribution. Algiers (*Weinkauff*), Minorca (*Hidalgo*), Palermo (*Monterosato*), Adventure Bank ('Shearwater' Exp.); 16–120 fms. Canary I. (*McAndrew*); 30–120 fns.

Not *Nacca marmorata* of Risso, which appears, from the description, to be *Natica imbricata*.

The sculpture of the Mediterranean shell is somewhat different from that in Mr. Adams's description. Instead of being very finely and obliquely striated (or whatever may be meant by "striatula"), the surface is microscopically but irregularly reticulated. It differs from *N. flammulata* in the peculiar colouring of the shell, and the shape of the umbilical callus. The operculum is calcareous in a specimen which was kindly given me by my late friend Mr. McAndrew. I have already, in my work on British Conchology, endeavoured to give this excellent naturalist ample but fully-deserved credit for his long and persistent labours in exploring so many parts of the North Atlantic for the furtherance of our common science; and I would avail myself of the present opportunity to renew my grateful testimony. But the field of submarine researches has been, since his death, so greatly extended with respect to depth, that the result of his numerous dredgings in comparatively shallow water, although they were most useful, will become of less importance in considering the difficult problem of geographical distribution. See, for instance, the important paper of Dr. Fischer in the 'Comptes Rendus' for 1883, on some of the results of the last French Expedition, and the valuable communications of Professor Verrill to the Academy of Sciences at Cincinnati on the progress of the continued operations of the United States for similar objects.

This is *N. prietoi* of Hidalgo, ex typo.

19. NATICA DILLWYNI, (*dillwynii*) Payraudeau.

N. dillwynii, Payr. Moll. Corse, p. 120, t. v. f. 27, 28.
N. dillwyni, Hidalgo, Mol. mar. de Esp. lam. 20 c. f. 8, 9 (opt.).
'Porcupine' Exp. 1870: Med. St. G. Tunis (young).
Distribution. Throughout the Mediterranean and Adriatic, Jamaica (*C. B. Adams*, as *N. proxima*, in coll. McAndrew): var. *fusca*, of a dark hue, Corsica (*Susini*); var. *avellana*, nut-brown, Algiers (*Weinkauff*, af. typ.); 20–120 fms.
Fossil. Miocene: Calabria (*Seguenza*). Pliocene: Pezzo (*Philippi*).
N. avellana of Philippi is the nut-brown variety.

20. NATICA VITTATA, Gmelin.

Nerita vittata, Gm. ed. L. S. N. p. 3674.
Natica intricatoides, Hidalgo, Mol. mar. de Esp. lam. 20 B. f. 12, 13, lam. 20 c. f. 10, 11 (opt.).
'Porcupine' Exp. 1870: Atl. St. C. Espichel.
Distribution. Marocco (*Chemnitz*), Algiers (*Weinkauff, Joly*), Cadiz, Algesiras and Malaga (*Hidalgo*).
I quite agree with Herr Weinkauff that this is Gmelin's species, which was founded on the description and figures of Chemnitz, Conch. Cab. v. p. 271, t. 188. f. 1917, 1918. It is *Natica textilis* of Reeve, and *N. intricatoides* of Hildago ex typo.
Resembles *N. intricata* in shape; but the present species is much larger and more globular, the colouring is darker, the whorls are more convex, and the suture is consequently deeper, the spire is more produced, and the umbilicus has a sharp ridge in the middle, and a single (instead of double) groove below the ridge. According to Reeve, Mr. Cuming's specimen has a calcareous operculum; no habitat was given for it.

21. NATICA STERCUS-MUSCARUM, Gmelin.

Nerita stercus muscarum, Gmel. ed. L. S. N. (1788) p. 3673.
Natica hebræa, Hidalgo, Mol. mar. de Esp. lam. 20. f. 5–8 (opt.).
'Porcupine' Exp. 1870: Med. St. C. de Gata, Benzert Road, Adventure Bank.
Distribution. Quimper (*de Kermovan, f. Collard des Cherres*)?, throughout the European, African, and Asiatic coasts of the Mediterranean, Adriatic, and Canaries; 5–120 fms.
Fossil. Miocene: Vienna Basin and the Continent of Europe. Pliocene: Coralline Crag (as *N. multipunctata* of S. Wood), Belgian Crag, South of France, Italy, and Algeria. Post-tertiary: Morea, Rhodes, Corinth, and Cyprus.
Weinkauff has noted 14 synonyms. Martyn's specific name *hebræa* is four years older than that of Gmelin; but, as Von Martens and Weinkauff have pointed out, Martyn's nomenclature is not in accordance with the Linnean system. Lamarck's name *millepunctata* has been used by many conchologists, although it must be borne in mind that the only habitats which he gave (the

Indian Ocean and the coast of Madagascar) are certainly not applicable to this common Mediterranean species. Weinkauff regards the typical form (his *millepunctata*) and *N. hebræa* as different species. Karsten's name *punctata*, which was adopted by Risso without acknowledgment, or through coincidence, is ten years subsequent to Gmelin's.

Family XXI. Neritidæ.

Neritina viridis, Linné.

Nerita viridis, L. S. N. p. 1254; Chemnitz, Conch.-Cab. ix. t. 124. f. 1089.

'Porcupine' Exp. 1870: Med. St. Algesiras B.

Distribution. Mediterranean from the south of France to the coast of Syria, Adriatic, Madeira, Canaries, West Indies, and Martinique; 3–120 fms. It is an inhabitant of shallow water.

Fossil. Post-tertiary: Palermo (*Philippi*).

Varies in the intensity of colour as well as in the markings.

Family XXII. Solariidæ.

1. Solarium pseudoperspectivum, Brocchi.

Trochus pseudoperspectivus, Brc. Foss. Subap. ii. p. 359, t. v. f. 18.

Solarium discus, Philippi, Moll. Sic. ii. p. 225, t. xxviii. f. 12; Conch.-Cab. (ed. Küster), *Solarium*, p. 29, t. 4. f. 9.

'Porcupine' Exp. 1870: Med. St. 50, 51, Benzert Road, Rasel Amoush, Adventure Bank.

Distribution. Bay of Biscay ('Travailleur' Exp.), throughout the Mediterranean, Alexandria (*Lamarck*, as *S. perspectivum*), Barbary (*Ponsonby*), Canary I. (*McAndrew*); 40–108 fms.

Fossil. Miocene: Vienna Basin, Perpignan, and Calabria. Pliocene: (?) Biot near Antibes, Italy, Sicily, and Algeria. Post-tertiary: Selsea, Morea.

Owing to the variability of the shell, especially in the fossil state, the synonyms are rather numerous. I regard *S. simplex* of Bronn, *S. lyellii* of Michelotti, *S. discus* of Philippi, *S. sulcatum* of O. G. Costa (not of Lamarck), *S. pulchellum* of Tiberi (not of Michelotti), *S. perspectiforme* also of Tiberi, *S. mediterraneum* of Monterosato, probably *S. nuperrimum* of Brugnone, and perhaps *S. contextum* of Seguenza, as varieties of the present species. The number of concentric ridges or striæ, as well as the height of the spire, and consequent contraction of the umbilicus, differ in specimens from distant localities.

The lowest part or deepest interior of the umbilicus, which represents the obverse of the spire, is flattened, and has the whorls reversed or sinistral. Monterosato has described the animal in the 'Journal de Conchyliologie' for 1874.

2. Solarium carocollatum, Lamarck.

S. carocollatum, Lam. An. s. Vert. vii. p. 6.
S. moniliferum (Bronn), Monterosato, Notizie int. Sol. Med. f. 5, 6, 7.

'Porcupine' Exp. 1870: Atl. St. 6, 8, 9, 25–30; Med. C. de Gata, 50, Adventure Bank.

Distribution. Both sides of the Mediterranean, and off the Azores ('Josephine' Exp.): 40–600 fms.

Fossil. Miocene: Vienna Basin, Marseilles, and St. Domingo (*Hörnes*), Dax and Léognan (*Basterot*). Pliocene: (?) Biot, Northern and Central Italy, and Sicily.

S. moniliferum, Bronn, *S. affine*, Cantraine (not of Sowerby), and *S. alleryi*, Seguenza.

The same remarks as to the sculpture, spire, and umbilicus are applicable to this as well as to the last species.

Operculum imbricate. *Torinia*, Gray.

3. Solarium siculum, Cantraine.

S. siculum, Cantr. in Bull. Acad. Brux. ix. 2. p. 343 (1843).
S. stramineum, Philippi, Conch.-Cab. ed. Küster, p. 32, t. 4. f. 14.

'Porcupine' Exp. 1869: St. 45*a*, 45*b* (two living specimens). 1870: Atl. Setubal B., off C. Sagres; Med. 50, Benzert Road, Rasel Amoush, Adventure Bank.

Distribution. G. Gascony (*De Folin*), Vigo (*McAndrew*), Mediterranean, coast of Barbary (*Ponsonby*), Madeira and Canaries (*McAndrew*); 8–90 fms.

Fossil. Miocene: Calabria (*Seguenza*). Pliocene: (?) Biot, Central and Southern Italy. Post-tertiary: Rhodes (*Hörnes*).

S. stramineum, Philippi (but apparently not of Lamarck, whose species was founded on the description and figures of Chemnitz for a Tranquebar shell); it is also *S. fallaciosum* of Tiberi.

A specimen in Weinkauff's collection, named "*S. discus*, Phil.," is the young of the present species.

4. Solarium architæ, O. G. Costa.

S. architæ, O. G. Costa, Cat. test. viv. Taranto, in Atti Acc. Sc. iii. p. 40 (1830); Fauna del Napoli, p. 5, t. i. f. 1*a*, A, B, C (1841).

'Porcupine' Exp. 1870: Atl. St. C. Sagres; Med. 50, Benzert Road, Rasel Amoush, Adventure Bank.

Distribution. G. Gascony (*De Folin*) !, and throughout the Mediterranean; 30–120 fms.

Fossil. Pliocene: Bolognese (*Foresti*).

S. sowerbyi of Hanley.

The operculum is conical and prominent.

Homalaxis zanclæus, Philippi.

Bifrontia ? zanclæa, Ph. Moll. Sic. ii. p. 225, t. xxviii. f. 11.

'Porcupine' Exp. 1870: Atl. St. 27, 28, 28*a*; Med. Rasel Amoush, Adventure Bank.

Distribution. Mediterranean from Gibraltar to Palermo, Madeira (*McAndrew*), G. Mexico (*Pourtalès*), Jamaica (*Barrett*); 18–117 fms.

Fossil. Miocene: Calabria (*Seguenza*). Pliocene: (?) Biot, Central Italy, and Sicily.

Solarium aldrovandi of Foresti is a variety.

Deshayes proposed this genus in 1830 under the name of *Omalaxis* or *Omalalaxis*, and in 1832 as *Bifrontia*. The former name, slightly but necessarily altered in the spelling, must therefore be retained, although *Bifrontia* is equally appropriate. But I am not satisfied that the genus is distinct from *Solarium*. The shape of the shell, and especially of the peculiar operculum, closely resemble those of *S. architæ*. The sculpture of the present species varies greatly in respect of the short longitudinal striæ, which in some specimens are strong and close-set, and in others are entirely wanting. The whorls are often wholly or partly disjoined or are occasionally united.

1. Adeorbis supranitidus, S. Wood.

A. supranitidus, S. Wood, Mon. Crag Moll. in Pal. Soc. Publ. 1848, p. 137, t. xv. f. 5, *a*, *b*.

Omalaxis supranitida, G. O. Sars, Moll. reg. arct. Norv. p. 214, t. 22. f. 20, *a–c*.

'Porcupine' Exp. 1870: Atl. 36, Tangier B.

Distribution. Lofoten I. 200 fms. (*G. O. Sars*), New England (*Verrill*).

Fossil. Pliocene: Coralline Crag.

Both the 'Porcupine' specimens are imperfect; but they agree with Crag specimens in every respect (especially in being tricarinated) except in being spirally and rather strongly striated. *A. tricarinatus* of Searles Wood is certainly another variety, as he suspected. The spiral striæ are wanting in Norwegian specimens, but are conspicuous in the umbilicus of Crag specimens.

The operculum is not known; and it is therefore questionable whether the present species belongs to *Adeorbis* or to *Homalaxis*. It shares some of the characters of both genera.

2. Adeorbis subcarinatus, Montagu.

Helix subcarinata, Mont. Test. Brit. p. 438, t. 7. f. 9.

A. subcarinatus, B. C. iv. p. 231, pl. iii. f. 5; v. p. 216, pl. lxxix. f. 1.

'Porcupine' Exp. 1869: St. 18, Lough Swilly.

Distribution. British and Irish coasts, from Aberdeenshire to Guernsey, Atlantic coasts of France, Spain, and Portugal, throughout the Mediterranean and Adriatic, and Mogador; low water to 35 fms. The habitat is sublittoral.

Fossil. Miocene: Bordeaux Basin and Transylvania. Pliocene: Coralline and Red Crag, Belgian Crag, Central and Southern Italy. Post-tertiary: Portrush and Selsea.

Several obsolete synonyms.

The animal and its habits were described by Mr. Duprey in the 'Annals and Magazine of Natural History' for October 1876 and March 1883. I have verified the description.

3. Adeorbis fragilis, G. O. Sars.

A. fragilis, G. O. Sars, Moll. reg. arct. Norv. p. 213, t. 22. f. 19, *a–c*.

'Porcupine' Exp. 1870: Atl. 16, 27.

Distribution. Loffoden I. and western coast of Norway; 60–190 fms.

Somewhat resembling *A. pulchralis* of the Coralline Crag, but of a thinner texture, the spire more raised, the whorls more convex, the sculpture much slighter and irregular, and the umbilicus more open.

This and the next species appear to be closely allied to *Fossarus*, the position of which genus has not been satisfactorily determined: it was placed with *Solarium* by Woodward, in the *Littorina* family. According to Troschel, the dentition of *Fossarus* agrees in some respects with that of *Turritella*.

4. Adeorbis depressus, Seguenza. (Plate IV. figs. 8, 8 *a*.)

Fossarus depressus, Seg. Bull. Real. Comit. Geol. Ital. 1874, fasc. ii. p. 382.

'Porcupine' Exp. 1870: Atl. St. 24, 30.

Distribution. Algiers (*Weinkauff*, as *Fossarus crossei* of Kleiak)!, Strait of Messina (*Seguenza* and *Granata*)!, Palermo (*Monterosato*), Brindisi (*Aradas*)!; 11–108 fms.

Fossil. Pliocene: Messina (*Seguenza*).

This pretty little shell, examined under a microscope, is exquisitely sculptured by close-set longitudinal folds and intermediate spiral striæ, or thread-like lines. Some specimens have the whorls more or less disunited in cornucopia fashion. It seems to connect *Adeorbis* with *Fossarus*.

According to the catalogue of Kleiak's collection of Dalmatian shells his *Natica crosseana* is a synonym of *Fossarus petitianus*, Tiberi=*Stomatia azonea*, Brusina.

Fossarus reticulatus, S. Wood. (Plate IV. fig. 9.)

Lacuna reticulata, S. Wood, Mon. Crag Moll. vol. i. p. 122, t. xii. f. 10, and t. xv. f. 12.

Fossarus interjunctus, Jeffreys, MS.

Shell oblong, rather solid, semitransparent, lustreless: *sculpture*, numerous, curved, and rather sharp longitudinal ribs which cover the last or body-whorl; these and their interstices are crossed by more numerous close-set and minute spiral striæ, but not so as to cause cancellation; the upper whorls are quite smooth: *colour* light yellowish brown: *spire* somewhat elongated or extended, and ending in a blunt point: *whorls* 4, rather convex, the last disproportionately large, the uppermost bulbous and intorted: *suture* deep: *mouth* oval: *outer lip* thick: *inner lip* attached to the pillar: *umbilicus* none, except as regards a slight depression at the base. L. 0·06, B. 0·05.

'Porcupine' Exp. 1870: Atl. St. 36. A single and not quite perfect specimen.

It is not the young of any known species of *Fossarus*.

Since the above description was written I have ascertained, by comparison of specimens, that this species is the Coralline-Crag fossil, described and figured by the late Mr. Searles Wood under the name of *Lacuna reticulata*—which must therefore replace the specific name *interjunctus*, which I had imposed upon this form.

A. Not umbilicate.

1. Seguenzia formosa, Jeffreys.

S. formosa, Jeffr. in Proc. R. S. 1876, pp. 200, 201 (woodcuts); Ann. & Mag. Nat. Hist. 1877, p. 319; Journ. Linn. Soc., Zool. vol. xiv. p. 605.

'Porcupine' Exp. 1870: Atl. St. 17*a*, off C. Espichel, 22.

Distribution. 'Valorous' Exp., off Culebra I. and Bermudas ('Challenger' Exp.), G. Mexico (*Pourtalès*), off Marocco and C. Verd I. ('Talisman' Exp.), New-England coast (*Verrill*); 325–2033 fms.

Fossil. ?Miocene: Calabria (*Seguenza*). Pliocene: Sicily (*Seguenza*), Bologna (*Capellini*)!

Trochocochlea monocingulata, Seguenza, MS.

The sinus or slit in the outer lip of this remarkable shell would seem to indicate some corresponding organization of the animal. Similar instances occur in the cases of *Scissurella*, *Emarginula*, *Siliquaria*, *Pleurotomaria*, and the *Pleurotoma* family. Professor Verrill proposed to make *Seguenzia* the type of a distinct family; but until the animal is completely known (and not merely through the operculum and odontophore), I think it would be better to defer guessing as to the position of this genus in any scheme of classification.

B. Umbilicate.

2. Seguenzia elegans[1], Jeffreys. (Plate V. figs. 1, 1*a*.)

S. elegans, Jeffr. in Proc. R. S. 1876, p. 200.

Shell globose, and forming a short cone, rather thin, semitransparent, somewhat nacreous and glossy: *sculpture*, sharp spiral ridges or keels, of which there are 4 or 5 on the body-whorl, 2 on the penultimate and next whorls, and 1 on each of the upper whorls; there are also occasional and nearly microscopic thread-like spiral striæ between the ridges; the interstices of the ridges, and sometimes the ridges themselves, are crossed by rows of minute and numerous striæ in the opposite direction to the line of growth, some of these striæ being curved, others oblique, straight, or alternately arranged; in those specimens where the cross striæ extend

[1] Elegant.

over the spiral ridges, a nodose or tuberous appearance is caused by their intersection; the base is covered with delicate and close-set spiral striæ; apex smooth: *colour* pearly white: *suture* slight: *spire* short, turreted: *whorls* 5–6, convex; the last occupies three fourths of the shell; the first or topmost whorl is bulbous and intorted: *mouth* large, polygonal, irregularly sinuated at its base: *outer lip* thin and prominent: *fissure* placed a little below the suture of the last whorl; it is broad, deep, and ends in a curved indentation: *inner lip* none: *pillar* semicircular: *umbilicus* narrow, but distinct and deep-margined outside, and defined by a slight ridge or keel which terminates in a sharp and projecting point. L. 0·125, B. 0·1.

'Porcupine' Exp. 1870: Atl. St. 16, 17, 17*a*.

Distribution. Bay of Biscay ('Travailleur' Exp.).

Not *S. eritima* of Verrill, judging from the description and figure.

3. SEGUENZIA TRICARINATA[1], Jeffreys. (Plate V. fig. 2.)

SHELL globose, very thin and fragile, transparent, and of a glassy lustre: *sculpture*, three spiral thread-like striæ or keels on the body-whorl, viz. one encircling the periphery, another at a short distance below it, and a third at a somewhat greater distance above the peripheral stria; the penultimate whorl is marked with a similar stria, a little above the suture; the next whorl is keeled at the top: *colour* whitish: *suture* deep: *spire* short and compressed: *whorls* 3–4, convex; the last is disproportionally large; apex flattened: *mouth* roundish, angulated at the base: *outer lip* thin; fissure wide but shallow, forming an angular indentation: *inner lip* filmy: *pillar* gently curved and thickened: *umbilicus* narrow and shallow, margined outside by a slight but distinct semicircular stria or keel. L. 0·075, B. 0·075.

'Porcupine' Exp. 1870: Atl. St. 17*a*. A single but characteristic specimen.

Distribution. Off C. Verd. I. ('Talisman' Exp.); 1192 fms.

4. SEGUENZIA CARINATA, Jeffreys. (Plate V. figs. 3, 3 *a*.)

S. carinata, Jeffr. Proc. R. S. 1876, p. 201; Ann. & Mag. Nat. Hist. 1877, p. 320.

'Porcupine' Exp. 1870: Atl. St. 16, 17*a*, off C. Espichel, 22.

Distribution. North Atlantic ('Valorous' Exp.), off Fayal, Azores ('Challenger' Exp.), off Marocco, Sahara, C. Verd. I., and Azores ('Talisman' Exp.); 681–2199 fms.

This species has a labial slit as in the typical species *S. formosa*.

5. SEGUENZIA RETICULATA, Philippi.

Solarium reticulatum, Phil. Moll. Sic. ii. p. 149, t. xxv. f. 6.

'Porcupine' Exp. 1870: Atl. St. 9, 16, 17, 17*a*.

Distribution. Coast of Portugal ('Travailleur' Exp.), off Ascension I., and Culebra I. ('Challenger' Exp.); 390–1791 fms.

[1] Having three keels.

Fossil. Pliocene: Lamato in Calabria (*Philippi*).
Trochus (Solariella) lusitanicus, Fischer.
An elegant and exquisitely sculptured shell.

6. SEGUENZIA LAXA[1], Jeffreys. (Plate V. figs. 4, 4 *a*.)

SHELL imperfect, consisting of scarcely two whorls; these are cylindrical and scalariform, spirally and regularly striated: *mouth* nearly detached, squarish; expanding on the inner or pillar side, and somewhat effuse or spread out at the base: *umbilicus* narrow and contracted, but deep. L. (apparently) 0·25, B. 0·2.

'Porcupine' Exp. 1870: Atl. St. 16. A fragmentary specimen, but peculiar and worth noticing. Whether it belongs to the present genus, or even to the same family, may be doubtful. However, a perfect specimen will be probably discovered in future deep-sea expeditions.

Family XXIII. XENOPHORIDÆ.

XENOPHORA CRISPA, König.

Trochus crispus (König), Bronn in Italiens Tertiär-Gebilde, 1831, p. 62.

'Porcupine' Exp. 1870: Med. St. 40, 41, Rasel Amoush, 58.

Distribution. G. Gascony (*De Folin*), Mediterranean (*Deshayes*), Sardinia and Bona (*Tiberi*), Tuscany (*Appelius*), W. Africa (*v. Martens*), C. Verd I. ('Gazelle' Exp.), off Sahara ('Talisman' Exp.); 47–486 fms.

Fossil. Pliocene; throughout Italy. ? Post-tertiary: Rhodes.

X. mediterranea of Tiberi, and *X. commutata* of Fischer. I cannot distinguish the living from the fossil form by any valid character. The only ground of such distinction would be that usually the umbilicus is more or less open in the former and more or less closed in the latter. But of two Tertiary specimens now before me from Castel d'Arquato, for which I am indebted to the kindness of Count Angelo Manzoni, one has the umbilicus open and the other has it closed. Bronn says in his description of *Trochus crispus*, "Umbilico subvariabili, primum aperto, serius subsemiclauso." In consequence of having in the course of my continued labours for more than half a century examined so many thousand, indeed I might say so many ten thousand, specimens of shells from different parts of the North Atlantic, I may perhaps be more inclined to unite or "lump" than subdivide or "split" species; and if any explanation be expected from me for not having adopted all the species proposed by continental conchologists, whose power of discrimination is fully equal, if not superior, to my own, I hope to be excused by them in that spirit which is the bond of all science. My old and much valued friend Dr. Tiberi is entitled to the credit of having discovered or confirmed the discovery of the present species as an inhabitant of the Mediterranean.

Woodward strangely placed this genus with *Solarium* in the *Littorina* family, and he assigned to it Montfort's name of *Phorus*;

[1] Loose.

but Fischer de Waldheim's name of *Xenophora* has the priority of three years over that of Montfort.

The apex of the shell forms a short but compact cone of several smooth whorls.

Family XXIV. Velutinidæ.

1. Lamellaria perspicua, Linné.

Helix perspicua, L. S. N. p. 1250.

L. perspicua, B. C. iv. p. 235, pl. iii. f. 6; v. p. 235, pl. lxxix. f. 2.

'Porcupine' Exp. 1870: Atl. St. 26; Med. Rasel Amoush, G. Tunis.

Distribution. Norway, Faroe I., Great Britain and Ireland, Brest (*Daniel*), Atlantic coasts of France and Spain (*Hidalgo*), throughout the Mediterranean and Adriatic, Canaries (*McAndrew*), Labrador, Canada, United States; 0–108 fms.

Fossil. Pliocene: Coralline Crag, Monte Mario, Calabria, and Sicily.

Bulla haliotoidea and *Lamellaria tentaculata*, Montagu, *Marsenia producta* and *complanata*, Leach, *Sigaretus vitreus*, O. G. Costa, and *S. audouinii*, Cantraine ex typo.

2. Lamellaria tenuis[1], Jeffreys. (Plate V. figs. 5–5 *b*.)

Shell nearly circular in outline with a concave base, thin and fragile, semitransparent and glossy: *sculpture*, extremely delicate, close-set, and microscopic spiral striæ; these are sometimes wanting on parts of the surface: *colour* clear white: *spire* small, laterally placed and depressed: *whorls* $2\frac{1}{2}$, rather convex; the last occupies five sixths of the shell; the first or apical whorl is sunken, incomplete, and twisted inwards: *suture* narrow, but deep: *mouth* nearly round and expanding: *outer lip* projecting above the periphery, and forming at the base a short and slightly reflected pillar: *inner lip* none: *umbilicus* small, but distinct and deep. L. 0·1, B. 0·15.

'Porcupine' Exp. 1870: Atl. St. 16. Four specimens.

It differs from *Sigaretus excavatus* of Searles Wood in shape, the spire, and the umbilicus, as described and figured in his Monograph on the Crag Mollusca.

This delicate little shell appears to be internal and completely enclosed within the mantle of the animal, because of its fragility, the incompleteness of the nucleus, and its not having any trace of an epidermis, which is conspicuous in *Sigaretus striatus* or *haliotoideus*. But the distinction between *Lamellaria* and *Sigaretus* is not so well defined as could be wished. The chief difference consists in the presence or absence of an operculum. The sculpture of the present shell resembles that of certain species of *Philine*.

[1] Thin.

Family XXV. Capulidæ.

This would seem to be the natural position of the family. Mr. Jabez Hogg, in an excellent and beautifully illustrated paper on the lingual membrane of Mollusca (Trans. Roy. Micr. Soc. xvi. n. s.), says as to *Capulus hungaricus*, "Dentition is seen to be almost identical with *Velutina*."

Capulus hungaricus, Linné.

Patella ungarica, L. S. N. p. 1259.

C. hungaricus, B. C. iii. p. 269, pl. vi. f. 5; v. p. 201, pl. lix. f. 6, 6*a*.

'Lightning' Exp., St. 2, 4.

'Porcupine' Exp. 1869: St. 2, 45*a*, 45*b*, 70. 1870: Atl. 9, 10, 13, 16, 27, 28, 28*a*, 36; Med. Rasel Amoush, Adventure Bank.

Distribution. From arctic Norway to the Mediterranean, Ægean, and Adriatic, New England (*Verrill*); 0–458 fms.

Fossil. All the Tertiary fossiliferous beds in Europe; 0–1360 ft.

There are many obsolete and useless synonyms, including so-called species of the fossil so-called genus *Brocchia*. See my 'Notes on Brocchi's Collection of Subapennine Shells' in the Quarterly Journal of the Geological Society for February 1884. The young has been called *Capulus* or *Peleopsis militaris*.

This common shell attains to a considerable size. I have one from Algiers exceeding two inches in length; and I noticed a still larger specimen in Dr. Tiberi's collection from the Bay of Naples. Owing to its quasi-parasitic habit it is very liable to distortion in various ways, being sometimes compressed laterally, expanded, obliquely formed, or angulated, as in Crag specimens of Searles Wood and Mr. Alfred Bell.

Family XXVI. Cancellariidæ.

1. Torellia vestita, Jeffreys.

T. vestita, B. C. iv. p. 244, pl. iv. f. 1; v. pl. lxxix. f. 5.

'Lightning' Exp. St. 4.

'Porcupine' Exp. 1869: St. 23, 30, 58.

Distribution. Norway, from Lofoden I. southwards (*Lovén* and others), Shetland (*Barlee*), New England and G. Maine (*Verrill*); 4½–317 fms.

Herr Friele informs me that the animal is of a pale flesh-colour, the head not very prominent and notched in front; tentacles rather long and pointed; eyes on small bulbs near the outer base of the tentacles; the foot longish and narrow, broader, truncated, and horizontally cloven in front. Professor G. O. Sars has lately dredged on the west coast of Norway a very large and living specimen, more than an inch long.

The operculum is small, acutely triangular like that of *Trophon* and *Fusus*, and is ridged transversely.

The genus *Choristes* of the late Dr. Philip Carpenter, from the

Post-tertiary formation near Montreal, is a synonym of *Torellia*. His *C. elegans* closely approaches the present species, and seems to differ chiefly in having a smooth epidermis.

2. Torellia ? delicata, Philippi.

Cyclostoma ? delicatum, Phil. Moll. Sic. ii. p. 222, t. xxviii. f. 3.

'Porcupine' Exp. 1870: Atl. St. 16, 17 *a*, 24.

Fossil. Pliocene: Messina and Calabria (*Otto f. Philippi*, and *Seguenza*).

Through the kindness of my friend Professor Seguenza, I have compared a fossil specimen with the recent specimens from the 'Porcupine' Expedition; and all of them exactly agree, as well as with the description and figures of Philippi. The sculpture is most delicate and exquisitely reticulated. My largest and most perfect of the 'Porcupine' specimens is more abnormal than the rest (perhaps a variety), and resembles in shape *Lacuna pallidula*. I have therefore figured it as a variety of the present species in Plate V. figs. 6, 6 *a*.

Although this shell certainly does not belong to *Cyclostoma*, as doubtfully given by Philippi, it wants some of the characters of *Torellia*, as defined by me in 'British Conchology,' vol. iv. p. 244, viz. the velvety epidermis and tubercle on the pillar. In my correspondence with Prof. Seguenza some years ago, I had suggested the generic name *Trachyoma*, which he adopted in his excellent treatise on the Tertiary formation of Reggio province in Calabria, 1879.

1. Trichotropis borealis, Broderip and Sowerby.

T. borealis, Br. and Sow. in Zool. Journ. iv. p. 375: B. C. iv. p. 245, pl. iv. f. 2; v. p. 216, pl. lxxix. f. 6.

'Lightning' Exp. St. 4.

'Porcupine' Exp. 1869: St. 68.

Distribution. Arctic ocean in both hemispheres, Iceland, Faroe I., Norway, Shetland to the Dogger Bank and coasts of Ireland, N.E. and N.W. America; 2–175 fms.

Fossil. Pliocene: Coralline Crag, Sicily (*Brugnone*). Post-tertiary: Norway and Sweden, Scotland, Ireland, North of England and Wales, Siberia, Labrador, and Canada; 0–1360 ft. It appears that the genus is not restricted to northern seas, Mr. Ball having described a species from the Havana coast, below the Tropic of Cancer.

Synonyms so numerous that it would be unnecessary to quote them. *T. inermis* of Hinds was founded on a specimen which had lost its bristly epidermis.

An imperfect specimen of a species, which Friele procured in the 'Vöringen' Expedition on the arctic coast of Norway in 650 fathoms and named "*Trichotropis (Iphinöe) inflata*," occurred at Station 23*a* of the 'Porcupine Expedition' in 1869.

2. Trichotropis fimbriata [1], Jeffreys. (Plate V. figs. 7, 7*a*.)

Shell oblong, thin, semitransparent, nearly lustreless: *sculpture*, several rows or ridges of fine spiral striæ, which are covered by short and close-set bristles of the epidermis; there are from eight to ten of these rows on the body-whorl, two on the next, and one on each of the two succeeding whorls; the interstices of these rows as well as the rest of the shell marked lengthwise by very slight and microscopic lines: *colour* yellowish-brown: *spire* elongated, bluntly crested at the top: *whorls* 4–5, convex, somewhat turreted, regularly increasing in growth; the last equals one half of the spire when the mouth is placed downwards; the apical whorl is compressed and slightly intorted: *suture* deep: *mouth* triangularly oval, about two fifths the length of the spire: *outer lip* curved, thin-edged, angular and inflected above, expanded at the base, but not notched: *inner lip* filmy: *pillar* almost straight: *umbilicus* none. L. 0·1, B. 0·075.

'Porcupine' Exp. 1869: St. 16. A single specimen.

3. Trichotropis densistriata [2], Jeffreys. (Plate V. figs. 8, 8*a*.)

Shell oval, thin, semitransparent, and nearly lustreless: *sculpture*, numerous rows of exceedingly fine spiral striæ, which are covered by minute and close-set prickles; there are from 20 to 25 of these rows on the body-whorl, and from eight to ten on the penultimate whorl: *colour* pale yellowish-brown: *spire* short, blunt at the top: *whorls* 3–4, rather tumid; the last equals two thirds of the shell with the mouth downwards, or placed in a prone position; the apical whorl is irregular: *suture* well marked but not deep: *mouth* exactly oval, about half the length of the spire: *outer lip* rounded, thin, angulated above, notched below: *inner lip* thickened: *pillar* curved, abruptly terminating in a sharp point at the base, below which is formed the basal notch: *umbilicus* none. L. 0·085, B. 0·065.

'Porcupine' Exp. 1869: St. 16, 23 *a*. A single specimen from each station.

Distribution. C. Verd I. ('Talisman' Exp.); 1192 fms.

This minute species seems from the notched base to connect *Trichotropis* with *Admete*.

1. Cancellaria viridula, Fabricius.

Tritonium viridulum, Fabr. Fn. Gr. p. 402.

Admete viridula, G. O. Sars, Moll. reg. arct. Norv. p. 215, t. 13. f. 1 *a*, *b*, 2.

'Lightning' Exp.: St. 1, 3.

'Porcupine' Exp. 1869: 61, 65. 1870: Atl. 1, 2.

Distribution. Arctic seas in the Atlantic and Pacific, Iceland, Norway, C. Cod northwards, and North Japan; 2–1255 fms.

Fossil. Pliocene: English and Belgian Crags, Iceland. Post-

[1] Fringed. [2] Closely striated.

tertiary: Siberia, Norway, Bridlington, Lancashire, Cheshire, and Labrador.

Murex costellifer, J. Sowerby, *Admete crispa*, Möller, and *Cancellaria buccinoides*, Couthouy.

Among the varieties are one having the spire produced or elongated, and another which is much larger. The columellar folds are much stronger and more conspicuous in specimens from Spitzbergen and North America, and from the fossil bed at Bridlington. Spire bulbous and intorted. The animal was described by me in the 'Annals and Magazine of Natural History' for April 1877.

2. Cancellaria mitræformis, Brocchi.

Voluta mitræformis, Brc. Conch. foss. Subap. ii. p. 645, t. xv. f. 13.

C. pusilla, H. Ad. in P. Z. S. 1869, p. 274, pl. 19. f. 12.

'Porcupine' Exp. 1870: Alt. St. 16, 24, 25, 28, 30.

Distribution. B. Biscay ('Trav.' Exp. 1882), 249 fms.!, Canary I. (*McAndrew*)!

Fossil. Pliocene: Coralline Crag, Denmark (*Mörch*), Biot, and throughout Italy.

This appears to be a variety of Brocchi's species, and may be a somewhat altered descendant. The chief difference between the recent and fossil shell seems to consist in the former having only a few spiral ridges, while the latter is closely striated in the same direction as well as indistinctly reticulated by numerous and slight longitudinal striæ.

Not *C. pusilla* of Sowerby's 'Conchological Illustrations,' 1841.

3. Cancellaria minima, Reeve.

C. minima, Reeve, Conch. Icon. (*Cancellaria*), pl. xvii. f. 77, *a*, *b*.

'Porcupine' Exp. 1870: Alt. St. 28. Five specimens.

Distribution. Gibraltar and Madeira (*McAndrew*).

No habitat is given in Reeve's work, Cuming's collection being the only authority.

Allied to *C. subangulosa* of S. Wood from the Coralline Crag, but differs in the want of angularity, as well as in the stronger and coarser sculpture, especially with respect to the longitudinal ribs; the sculpture of the apex is also different, consisting in the recent species of very fine and microscopic spiral lines, and in the fossil shell of minute longitudinal striæ. A variety of *C. minima*, which has the whorls angulated below the suture as in the fossil species, was dredged by McAndrew with the typical form off Madeira and the Canaries; this has the same sculpture as in the recent species; and perhaps all these forms may represent one and the same species. In that case Searles Wood's name *subangulosa* would have priority over that of Reeve.

4. Cancellaria cancellata, Linné.

Voluta cancellata, L. S. N. p. 1191.

C. cancellata, De Blainville, Faune Franç. p. 142, pl. 4 B. f. 1; Hid. Mol. mar. de Esp. lam. ii. f. 3, 4 (opt.).

'Porcupine' Exp. 1870: Atl. St. C. Sagres (fr.); Med. 50, Benzert Road, Rasel Amoush.

Distribution. G. Gascony (*De Folin*), Atlantic coasts of Spain and Western Africa, Mediterranean and Adriatic; 4–100 fms.

Fossil. Miocene: Vienna and Bordeaux Basins, Northern and Central Italy. Pliocene: Denmark (*Mörch*), Biot, Italy, Algeria, and C. Verd I. (*Rochebrune*).

C. similis of Sowerby is scarcely a variety.

The apex of the shell is trochiform and different from that of other species; it resembles in shape and sculpture the apex of *Columbella haliæeti*.

Family XXVII. Aporrhaïdæ.

1. Aporrhaïs pes-pelecani, Linné.

Strombus pes-pelecani, L. S. N. p. 1207.

A. pes-pelecani, B. C. iv. p. 250, pl. iv. f. 3; v. p. 216, pl. lxxx. f. 1.

'Lightning' Exp. St. 5.

'Porcupine' Exp. 1869: 2, 13–15, 18, 35, the Minch, off Lerwick. 1870: Atl. 2, 10, 11, C. Sagres; Med. C. de Gata, 55, G. Bona, Benzert Road, G. Tunis. Specimens from Cape Sagres and the last three stations belong to a variety which I would name *carinata*. They are keeled in the middle of each whorl, the ribs are nodose, and the spire tapers to a fine point. This variety may be *meridionalis* of Basterot.

Distribution. Throughout the North Atlantic from Iceland and Finmark to the Mediterranean, Adriatic, and Ægean; 6–100 fms.

Fossil. Every Miocene, Pliocene, and Post-tertiary or Quaternary bed in Europe, as well as the last in Rhodes and Cos, from the sea-level to 1360 feet above it. Var. *carinata*, Coralline Crag (S. Wood, as probably *A. serresianus*).

2. Aporrhaïs serresianus, Michaud.

Rostellaria serresiana, Mich. in Bull. Soc. Linn. Bord. 1828, p. 120, f. 3, 4.

Chenopus serresianus, Philippi, Moll. Sic. ii. p. 185, t. xxvii. f. 8.

Var. *A. macandreæ*, B. C. iv. p. 253; v. p. 216, pl. lxxx. f. 2.

'Porcupine' Exp. 1869: St. 1, 3, 5, 6, 10, 17, 18, 23*a*, 45*a*, 45*b*, 64, 65, 68, 70, Little Minch, off Lerwick. 1870: Atl. 3, 3*a*, 6, 8–14, C. Sagres, 26–28*a*; Med. 50*a*, off Jijeli and Rinaldo's Chair, Adventure Bank. Variable as to the number and position of the spikes. One monstrous specimen has a spur which projects from behind the lower part of the pillar, besides a double spike at the base. Another specimen is somewhat scalariform. The variety *macandreæ* is smaller and more slender; it occurs with the typical form in the Mediterranean.

Distribution. Finmark, Lofoden I., West Norway, between the Faroes and Hebrides, Shetland, Bay of Biscay, Mediterranean, and Adriatic; 40–913 fms.

Fossil. Pliocene: Belgian Crag (*Van Beneden*, as *A. pes-carbonis*), Calabria and Sicily (*Philippi* and others as *Chenopus desciscens*).

I extract from my notes made in the 'Porcupine' Expedition of 1862, the following description of the animal of the variety *macandreæ*:—Body cream-colour: snout cylindrical and extensible, pinkish, with a yellow streak half way down the middle in front; the extremity is edged with a yellowish rim or border and is also of the same colour underneath: *tentacles* thread-like and very slender, marked with a narrow white line down the middle in front: *eyes* very small, sessile on the tentacles at their outer base: *foot* long and narrow, squarish in front and pointed behind.

Having since the publication of my work on British Conchology dredged on the western coast of Ireland, as well as in the northern part of our seas, specimens of much larger size than those which I had described as *A. macandreæ*, even exceeding those of *A. serresianus* from the Mediterranean, I now feel myself obliged to give up my species and to consider it a variety.

My suspicion that *Chenopus desciscens* of Philippi was a fossil representative or form of the present species, or rather of the variety *macandreæ*, has been verified by a comparison with recent specimens, which has been effected through the obliging transmission by Prof. Seguenza of fossil specimens of *C. desciscens.* I may here remark that Philippi, in his 'Handbuch der Conchyliologie und Malacozoologie' (published nine years after the last volume of his work on the Mollusca of the Two Sicilies), restored the far older generic name *Aporrhaïs* and substituted it for *Chenopus.*

It is almost impossible to say whether *Rostellaria pes-carbonis* of Brongniart was intended for *A. serresianus* or for some other Pliocene species from the Vicentia district. His description and figure were necessarily incomplete, being avowedly founded on a fragmentary and very imperfect specimen. I have received from correspondents under the former name a very different species from *A. serresianus.*

Family XXVIII. Cerithiidæ.

This family has been lately placed by the Marquis di Monterosato between *Muricidæ* and *Pleurotomidæ*, although no reason is given for this apparently strange allocation. While giving my old friend and correspondent full credit for his knowledge of Mediterranean shells, and for his industry which is evidenced by his last work, 'Nomenclatura generica e specifica di alcune Conchiglie Mediterranee,' I cannot help regretting that he has not described the numerous so-called species to which he has from time to time given names only. These names cannot be recognized under the present or perhaps any system of classification, but must be treated as manuscript. With respect to his proposed multiplication of new genera and species on a very extensive scale, he is of course at perfect liberty to please himself; time, however, will show whether other conchologists will adopt them. And I would also observe that it is unusual, if not discourteous, to so positively and *ex cathedrâ* contradict other writers—who have the same means and ability as himself for judging as to the authority of species previously published —without offering some reason for his dissent from their opinion.

Genus Stilus[1], Jeffreys.

Shell spit-shaped, reticulated; apex forming a twisted and abruptly semidetached peak; basal groove short and recurved.

The peculiarity of this genus consists in the apex, which is different from that of any other genus which I know. I consider this character important.

Stilus insignis[2], Jeffreys. (Plate VI. figs. 1–1 *b*.)

Shell obeliscoid, rather thick, opaque, but glossy: *sculpture*, numerous and somewhat curved longitudinal ribs, of which there are from 30 to 40 on the last whorl; these are crossed by 3 spiral striæ on each whorl, so as to cause by their intersection minute tubercles on the striæ; the periphery is encircled by a slight ridge; the base is quite smooth and somewhat concave; the ribs on the apical or top whorls are very few and flexuous: *colour* white: *spire* tapering, and abruptly terminating in a short, twisted, and upturned point: *whorls* 10–12, flattened, and gradually enlarging; the last equals about one third of the shell: *suture* narrow, but well defined: *mouth* small, squarish, with a short recurved groove turning to the left, as in typical species of this family: *outer lip* thin, scalloped or indented by the spiral striæ: *inner lip* inconspicuous: *pillar* flexuous. L. 0·25, B. 0·075.

'Porcupine' Exp. 1870: Atl. St. 29, 31–34. Several specimens.

Læocochlis granosa, Searles Wood.

C. granosum, S. Wood, Crag Moll. 1848, p. 73, pl. viii. f. 9.

L. granosa, G. O. Sars, Moll. reg. arct. Norv. p. 190, t. 13. f. 6.

'Lightning' Exp. St. 2.

'Porcupine' Exp. 1869: 23*a*, 65, 89, 90.

Distribution. Norway from Finmark to Bergen, North Sea Exp. (*Metzger*); 30–300 fms.

Fossil. Pliocene: Red and Coralline Crags, Antwerp Crag (Brussels Museum, as *C. sinistratum* of Nyst, although the species described and figured by him is apparently different)!

Triforis macandreæ of H. Adams, *Triforis nivea* of M. Sars's MS., and *Læocochlis pomeraniæ* of Dunker and Metzger.

The spire in this singular genus, which was established by Dunker and Metzger, is reversed or sinistrorsal; the basal groove is recurved and twisted; and the apex is sculptured, as in typical species of

[1] Having the shape of a Roman style or instrument for writing on waxen tablets.

[2] Remarkable.

Cerithium. It has no operculum. Professor G. O. Sars has kindly furnished me with the following remarks as to the odontophore of *L. granosa* compared with that of *C. tuberculatum*:—"In the former it is remarkably slender, and has all the plates (including the uncini) nearly uniform in shape and strongly curved, almost hooked, without distinctly marked secondary teeth; whereas in *C. tuberculatum* the odontophore (as in *C. reticulatum*) is comparatively short and broad, with the middle and lateral plates strongly denticulated at the edge, and the uncini rather slender. Moreover the jaws in the two forms are of a somewhat different shape." I do not, however, attach much importance to the character of dentition alone, because it must depend on the nature of the food, and cannot be distinguishable in the fossil state.

At first sight the Crag form would seem to be different from the recent or living form, because the former is cancellated or reticulated, while the latter has spiral striæ only. But this difference disappears in the examination of a great many recent specimens, some of which have the longitudinal striæ or ribs stronger and more developed than in other specimens: this partly accounts for the sculpture, and some allowance must be made for the rubbed or abraded condition of nearly all fossil (and especially Red Crag) shells. One of my recent specimens is uniformly reticulated.

1. Cerithium tuberculatum, Linné.

Strombus tuberculatus, L. S. N. p. 1213; B. C. iv. p. 264.

C. vulgatum, De Blainville, Fn. Franç. p. 153, pl. 6 A. f. 1, & p. 154, same plate, f. 5; Philippi, Moll. Sic. i. p. 192, t. xi. f. 3, 4, 5, 8, 9.

'Porcupine' Exp. 1870: Atl. St. 26 (fragment); Med. Capo de Gata, 55.

Distribution. Bergen and Manger on the western coast of Norway, in the stomachs of cod (*M. Sars*), Jersey (*J. G. J.*; dead specimens), Herm (*Dodd*; also dead), Brest and adjacent coast (*Daniel*), Pornichet in the Loire-inférieure (*Cailliaud*; living), Atlantic coast of Spain (*Hidalgo*), throughout the Mediterranean, Black Sea, Adriatic, Senegal (*Adanson*), Canaries (*d'Orbigny* and *McAndrew*), Madeira (*McAndrew*); 0–120 fms. Inhabits the littoral and laminarian zones.

Fossil. Miocene, Pliocene, and Post-tertiary: Vienna and Bordeaux Basins, Transylvania, Biot, Italy, Rhodes, Cos, Cyprus, Morea, Algeria, and C. Verd I.

This abundant species is of course extremely variable in respect of the proportionate dimensions, size, and sculpture, and has received numerous synonyms. Weinkauff has noted eleven.

Caruana says that the Maltese name is "brancutlu," and that it is used for food.

2. Cerithium procerum, Jeffreys. (Plate VI. figs. 2, 2 *a*.)

C. procerum, Jeffr. in Ann. & Mag. N. H. April 1877, p. 322.

'Lightning' Exp. St. 1.

'Porcupine' Exp. 1869: 23*a*. 1870: Atl. 22.

Distribution. North Atlantic ('Valorous' Exp.), Spitzbergen ('Vöringen' Exp.), between the Faroes and Hebrides ('Triton' cruise); 400–1450 fms.

C. danielsseni, Friele. *C. procerum* of Kiener is, according to Deshayes, a variety of *C. fasciatum* of Bruguière.

3. Cerithium metula, Lovén.

C. metula, Lov. Ind. Moll. Scand. p. 23: B. C. iv. p. 256; v. p. 217, pl. lxx. f. 3.

'Lightning' Exp. St. 2, 5.

'Porcupine' Exp. 1869: 23*a*, 42, 47, 61, 65. 1870: Atl. 1, 2, 3, 6, 9, 16, 24–30.

Distribution. Spitzbergen ('Vöringen' Exp.), Finmark to Christianiafiord and North Sea, Shetland, between the Faroes and Hebrides ('Knight Errant' and 'Triton' cruises), Fair Isle (*Möller*, *f. Mörch*), Bay of Biscay ('Travailleur' Exp.), Villafranca (*Hanley*); 20–650 fms.

C. nitidum, Mc Andrew and Forbes.

The number of the spiral ridges varies from 2 to 3; and the arrangement of the ridges is not uniform, being more compact or remote in some specimens than in others.

The type of G. O. Sars's genus *Lovenella*.

4. Cerithium gracile[1], Jeffreys. (Plate VI. figs. 3, 3 *a*.)

Shell resembling *C. metula* in shape, but smaller and more slender, semitransparent, very glossy and of a prismatic lustre: *sculpture*, numerous curved longitudinal riblets, which are crossed by fine and thread-like spiral ridges; of these last there are three on the last or body-whorl (viz. one below the periphery, the second or strongest encircling the periphery, and the third placed just below the suture); the ridges on each of the succeeding whorls are two in number, the larger being central, more prominent, and giving an angulated or keel-like appearance; the base of the shell is quite smooth and somewhat concave; the apex is also smooth; the intercrossing of the longitudinal and spiral striæ produces a few slight nodules in the middle of the shell, but not the tuberculated character of the last species: *colour* glossy white: *spire* tapering to a blunt point: *whorls* 12, rather convex, gradually enlarging; the last occupies one third of the spire with the mouth of the shell placed upwards; the first or apical whorl is bulbous and obliquely twisted: *suture* defined more distinctly than in the other species: *mouth* irregularly rhombic, with a deep and wide groove at the base as in that species; its length is about one fourth of the shell: *outer lip* thickish, indented or scalloped by the spiral ridges: *inner lip* filmy: *pillar* flexuous. L. 0·3, B. 0·075.

'Porcupine' Exp. 1870: Atl. St. 3. A single but perfect and living specimen.

[1] Slender.

Distribution. Off Sahara, C. Verd I., and Azores ('Talisman' Exp.); 681–1261 fms.

This elegant shell is closely allied to *Cerithiella whiteavesii* of Verrill, from the coast of New England, and may be the same species.

5. CERITHIUM OBELISCOÏDES[1], Jeffreys. (Plate VI. figs. 4, 4 *a*.)

SHELL pyramidal, rather thin, semitransparent, and glossy: *sculpture*, more or less numerous fine and rounded longitudinal striæ, which are crossed by a few spiral striæ: of the latter there are 5 or 6 on the last whorl, 4 or 5 on the penultimate, and 3 or 4 on the following three or four whorls; the second whorl is marked by close-set and more curved longitudinal striæ; the top whorl is quite smooth, as well as the base of the shell; the intersection of the two sets of striæ gives a reticulated but not a decidedly nodulous appearance; a considerable space below the suture in each whorl has the longitudinal striæ only: *colour* milk-white: *spire* gradually tapering to a very blunt point: *whorls* 7–9, convex; the last is equal to two fifths of the spire in length; the first whorl is bulbous, and in some specimens is larger and broader than the succeeding whorl: *suture* rather deep, defined by the lowest and thread-like of the spiral striæ: *mouth* as in the other species of this section, but smaller and with a shorter groove: *outer lip* thin, scalloped: *inner lip* inconspicuous: *pillar* flexuous. L. 0·175, B. 0·05. Some imperfect specimens show that this species attains a comparatively much greater size.

'Porcupine' Exp. 1870: Atl. St. 16, 17, 17*a*.

6. CERITHIUM CYLINDRATUM[2], Jeffreys. (Plate VI. figs. 5, 5*a*.)

SHELL rather cylindrical, thick, opaque, lustreless: *sculpture*, numerous straight longitudinal striæ, which are crossed by fewer and finer spiral thread-like striæ, so as to present a reticulated appearance and to make the points of intersection tuberous or scabrous; the spiral striæ are 4 on the last whorl, besides a basal line below the periphery, and 3 on each of the preceding whorls; the second, and sometimes also the third, whorl is marked with close-set and curved longitudinal striæ; the first whorl is quite smooth and glossy: *colour* pale yellowish-brown: *spire* gradually tapering to a blunt point: *whorls* 10–12, rounded but compressed; the last equals about one third of the length of the shell; the first is bulbous and like that of the last species: *suture* narrow but distinct: *mouth* as in all the foregoing species: *outer lip* thickish and prickly: *inner lip* filmy: *pillar* flexuous. L. 0·2, B. 0·075.

'Porcupine' Exp. 1870: Atl. St. 27–30, 36; Med. Benzert Road, Rasel Amoush, Adventure Bank.

This has somewhat the aspect of *Cerithiopsis tubercularis*, but the apex and mouth are those of a typical *Cerithium*.

[1] Like an obelisk.

[2] Cylindrical.

Bittium[1], Leach. Basal notch shallow and not recurved; apex regular.

7. CERITHIUM LACTEUM, Philippi.

C. lacteum, Phil. Moll. Sic. i. p. 195.

C. algerianum, Sowerby, Thes. Conch. p. 129, f. 230, 231.

'Porcupine' Exp. 1870: Atl. St. Tangier B.; Med. 50, Benzert Road, Rasel Amoush.

Distribution. Cap Breton (*De Folin*)!, Mediterranean and Adriatic, Madeira (*Watson*)!; 29–108 fms.

Fossil. Pliocene: Calabria and Sicily (*Philippi* and *Seguenza*), Madeira (*Mayer*). Post-tertiary: Sicily (*Aradas* and *Brugnone*).

Judging from the description and figure given by De Blainville of his *C. elegans* in the 'Faune Française,' I cannot agree with Weinkauff in regarding it as the present species.

8. CERITHIUM WATSONI, Jeffreys. (Plate VI. figs. 6, 6 *a*.)

C. gemmatum, Watson in Journ. Linn. Soc. (Zool.), vol. xv. p. 113 (1880).

'Porcupine' Exp. 1870: Atl. Vigo B., 13, 16, 17*a*, Setubal B., 24, 26–34, 36. Abundant.

Distribution. N. Spain ('Travailleur' Exp.), Setubal B. ('Challenger' Exp.), Josephine Bank ('Josephine' Exp.), off Marocco ('Talisman' Exp.); 217–1029 fms.

The animal is yellowish-white, with a faint tinge of brown in front: *snout* small: *tentacles* cylindrical, short: *eyes* seated on bulbous offsets of the tentacles, about one third from their bases: *foot* thick: *operculum* yellowish, circular, and paucispiral, with imbricated edges.

Sculpture variable, the longitudinal ribs sometimes disappearing on the last and next whorl, although the spiral ribs seem to be always present. Apex as in *C. lacteum*.

Not *C. gemmatum* of Hinds, 1844, the type of *Vertagus* of Klein, or *Rhinoclavis* of Swainson, which is a subgenus of *Cerithium* according to Dr. Paul Fischer. I have therefore given the present species the name of my friend the Rev. Robert Boog Watson, who has so admirably worked out the new species of Univalves from the 'Challenger' Expedition.

9. CERITHIUM RETICULATUM, Da Costa.

Strombiformis reticulatus, Da C. Brit. Conch. (1778) p. 117, pl. viii. f. 13.

C. reticulatum, B.C. iv. p. 258, pl. iv. f. 4; v. p. 217, pl. lxxx. f. 4.

'Porcupine' Exp. 1869: St. Donegal B. (large specimens), 33. 1870: Atl. Vigo B., 26, 30; Med. Algesiras B., 55, Benzert Road, G. Tunis, Adventure Bank.

[1] This name appears for the first time in Gray's 'List of Genera,' on the traditional or supposed authority of Dr. Leach. It does not occur in Scudder's 'Nomenclator Zoologicus,' 1882.

Distribution. Lofoden I. to Gibraltar, throughout the Mediterranean, Black Sea, Adriatic, Marocco, Canaries, and Azores; 0–140 fms. Inhabits the littoral and laminarian zones.

Fossil. Miocene, Pliocene, and Post-tertiary; throughout Europe, Cos, Rhodes, Cyprus, and Madeira; 0–200 ft.

For this abundant and widely spread species Weinkauff has particularized 17 synonyms; but I must demur to the inclusion of *C. angustissimum* of Forbes, which, according to the type now before me, is a species of *Cerithiopsis*, and the same species which Delle Chiaje described and named as *Cerithium metaxa*. The best known synonym is *Murex scaber* of Olivi, 1792.

It seems to be replaced on the northern coasts of the United States by *C. nigrum* of Totten. The longitudinal ribs or striæ are often varicose; hence Nyst described and figured a variety of the present species as a Crag fossil under the name of *C. variculosum*.

10. CERITHIUM PUSILLUM, Jeffreys.

Turritella? pusilla, Jeffr. in Ann. & Mag. N. H. Febr. 1856, p. 42, f. 10, 11.

'Porcupine' Exp. 1870: Atl. St. C. Sagres, 26, Tangier B.; Med. 50, Rasel Amoush, Adventure Bank.

Distribution. C. Breton (*De Folin*), Mediterranean and Black Sea; 12–120 fms.

Fossil. Miocene: Vienna Basin (*Hörnes*). Pliocene: Monte Mario, Calabria, Sicily, and Rhodes.

C. schwartzi, Hörnes, 1856, and *C. submammillatum*, Rayneval, 1864. Fischer says "non *C. pusillum*, Gould," and that it is anterior to my name; but I described and figured the present species in 1855–56, and Gould described his species in 1862.

The basal groove is so slight and shallow that I at first thought it might be a *Turritella*. Specimens are occasionally varicose.

SIPHONIBRANCHIATA.

Family XXIX. CERITHIOPSIDÆ.

1. TRIFORIS PERVERSA, Linné.

Trochus perversus, L. S. N. p. 1231.

Cerithium perversum, B. C. iv. p. 261; v. p. 217, pl. lxxx. f. 5.

'Porcupine' Exp. 1870: Atl. St. 26, 30, Tangier B.; Med. Algesiras B., 45, Benzert Road, Rasel Amoush, Adventure Bank.

Distribution. Christiansund and Bohuslän to Egypt, Black Sea, and Adriatic, Marocco, Madeira, Canaries, Azores, N. Pacific (*Cooper, f. P. Carpenter*); 0–205 fms.

Fossil. Miocene: Mayence and Vienna Basins, Transylvania and Calabria. Pliocene: Red and Coralline Crags, S. France, Italy, Morea, Rhodes, Cyprus, and Madeira. Post-tertiary: Scandinavia and Ireland; 0–120 ft.

I am now inclined to separate *Triforis* from *Cerithium* by reason of the differences in the apex or embryonic part of the shell and in the former having a short basal canal instead of a mere groove or notch. The spire of *Triforis* is finely pointed, in *Cerithium* it is blunt. In *Triforis* the apical whorls are much narrower in proportion, and are closely striated lengthwise. In *Triforis* the canal is small and nearly if not quite closed, as in *Murex*; in *Cerithium* the groove or notch is comparatively large and quite open. According to Meyer and Möbius there is also a characteristic distinction between the animals and odontophores of the two genera. The snout or proboscis in *Triforis* and *Cerithiopsis* is retractile, while in *Cerithium* it is contractile. The radula of *T. perversa* contains about 26 transverse and short denticulated plates. *Triforis* appears to be congeneric with *Cerithiopsis*, and to belong to the same family. When the shells of *T. perversa* and *C. tubercularis* are exhibited one before a mirror and the other not, it will be seen that almost the only differential character consists in the lower or basal portion of the mouth being more closed in the *Triforis* than in the *Cerithiopsis*.

Seguenza and Monterosato regard *T. perversa* and *T. adversa* as distinct species because the former is larger than the latter. I cannot agree to their separation on those grounds, and I am not aware of any other difference. Size seldom if ever constitutes by itself a specific character. Professor Stossich kindly gave me a specimen which is more than an inch long besides the apical whorls, which had disappeared, and another specimen which, although quite perfect, was scarcely a line or the tenth part of an inch in length; both specimens were from the Adriatic. Besides *Murex adversus* of Montagu there are many other synonyms.

Cerithium nigrocinctum of C. B. Adams, from the North-Atlantic coasts of the United States, is closely allied to the present species, if it be not the same or one a variety of the other.

2. Triforis aspera[1], Jeffreys. (Plate VI. figs. 7, 7*a*.)

Shell elongated, rather solid, nearly opaque and glossy: *sculpture*, rows or bands of small tubercles (18–20 on the last or bottom row), which arise from the mutual intercrossing of longitudinal and spiral striæ; of these rows there are usually three on the last whorl above the periphery, and the same number on several of the succeeding whorls and afterwards two only; each of the apical whorls (3 or 4) is closely striated lengthwise and encircled by two spiral lines; the periphery is defined by a rather strong ridge, a little below which is another ridge, besides a shorter and smaller one at the base; the tubercles which compose the lower two rows are larger and more prominent than those of the uppermost or third row: *colour* pale yellowish, with a faint tinge of brown; apical whorls dark brown: *spire* tapering to a fine point; apex pinched-in and narrower than the rest of the spire: *whorls* 21–22, compressed, gradually enlarging; the last equals only from $\frac{1}{5}$ to $\frac{1}{6}$ of the shell: *suture* slight, indicated by the

[1] Rough.

uppermost spiral row: *mouth* rhomboidal; and all other characters similar to those of *T. perversa*. L. 0·6, B. 0·15.

'Porcupine' Exp. 1870: Atl. St. 16, 24, 27–30; Med. Adventure Bank.

Distribution. Bay of Biscay ('Travailleur' Exp. 1882), Sciacca, Sicily (*Monterosato*), G. Mexico (*Pourtalès*); 125–731 fms.

Distinguishable from *T. perversa* by being more slender, and having more prominent tubercles so as to give the shell a rougher aspect. The base is also more square and as if truncated.

A. Typical; apex acuminated.

1. Cerithiopsis tubercularis, Montagu.

Murex tubercularis, Mont. Test. Brit. p. 270.

C. tubercularis, B. C. iv. p. 266, pl. iv. f. 5; v. p. 217, pl. lxxxi. f. 1.

'Lightning' Exp. St. 5.

'Porcupine' Exp. 1870: Atl. 3*a*, 13, Vigo B.; Med. Adventure Bank (var. *nana*).

Distribution. Christiansund (*Lilljeborg*)! to Alexandria (*Ponsonby*)!, W. Africa ('Talisman' Exp.)!, Madeira (*Watson*)!, Canaries (*Mc Andrew*)!, Boston Harbour southwards (*C. B. Adams* and others)!, G. Florida (*Dall*), Queen Charlotte's I. (*Whiteaves*); 0–1039 fms.

Hab. Littoral and laminarian zones.

Fossil. Miocene: Vienna Basin, Calabria, and ?Rhodes. Pliocene: Red and Coralline Crags, Belgium, Biot, Italy, and Rhodes. Post-tertiary: Norway, Scotland, Ireland, and ?Rhodes.

Cerithium pygmæum, Philippi, *Cerithium henkeliusii* (posthac *henkelii*), Nyst, *Cerithiopsis acicula* and *C. minima*, Brusina. Not *Cerithiopsis tuberculata*, P. Carpenter.

I must still retain my opinion that *C. clarkii*, alias *bilineata*, or *coppolæ*, is merely a monstrous or irregular form of the present species. One of my specimens, which has only two rows of tubercles on the lower whorls, has three rows on two of the upper whorls. The lower rows seem to have become squeezed together and elongated. A small and slender variety is *C. acicula* of Brusina, = *Cerithiolum dextrum*, Watson, ex typis. I regard *Cerithiopsis atalaya* of Watson as another variety.

Dr. Tiberi found large and small varieties of *C. tubercularis* living with *Modiolaria marmorata* in the tunic or outer coat of *Ascidia mentula* at Naples. Were the two mollusks commensal or quasi-parasitic, like species of *Eulima* and *Stilifer*?

De Blainville in his 'Faune Française' included not only this species but also *Cerithium reticulatum* and *Triforis perversa* in his *Cerithium tuberculare*.

The apical or top whorls in fresh and perfect specimens, when examined under a microscope, are seen to be very finely and closely ribbed lengthwise. Occasionally specimens have four rows of tubercles on the lower whorls.

2. Cerithiopsis diadema (Watson), Monterosato. (Plate VI. figs. 8, 8 *a*.)

C. diadema (Watson), Monterosato in Journ. de Conch. 1874, p. 273.

'Porcupine' Exp. 1870: Med. St. 45, Benzert Road, Rasel Amoush, Adventure Bank.

Distribution. Cap Breton (*De Folin*), G. Tunis ('Shearwater' Exp.)!, Sicily (*Stefanis* and *Monterosato*)!, Madeira (*Watson*)!, Canaries (*McAndrew*)!, Azores ('Challenger' Exp.)!; 22–500 fms.
Fossil. Post-tertiary: Messina (*Seguenza*).

C. fayalensis, Watson, in Journ. Linn. Soc. (Zool.) vol. xv. p. 125, 1880. I had proposed to name it *C. fibula*[1].

This pretty little shell, which was partly described by Monterosato, differs from *C. tubercularis* in being cylindrical, more elongate, narrow, and slender; its spire is finely tapering; and some of the longitudinal ribs are set obliquely. The uppermost whorl forms a smooth bulb, and the next two whorls are closely and rather obliquely ribbed lengthwise and crossed by a delicate spiral line near the base of each of those whorls, so as to give the apex an angulated appearance.

3. Cerithiopsis horrida[2], Jeffreys. (Plate VI. figs. 9, 9 *a*.)

Shell elongated, thick, opaque, and somewhat glossy: *sculpture*, numerous and crowded strong tubercles or nodules, which cover the surface and give it a rugged aspect; there are 4 rows of tubercles on the last whorl, and 3 on each of the upper whorls, except the two uppermost; the first or topmost is bulbous or globular and smooth, and the second is marked lengthwise with several short curved ribs; the base is concave and encircled by a slight ridge: *colour* pale brownish-yellow: *spire* tapering and turreted; apex blunt: *whorls* 15–16, rather flattened or compressed; the last equals about one fourth of the shell: *suture* narrowly channelled and distinct: *mouth* squarish, truncated at its base: *outer lip* thickened: *inner lip* forming a thick fold or deposit on the lower part of the pillar, which is nearly straight: *canal* very short and triangular. L. 0·35, B. 0·075.

'Porcupine' Exp. 1870: Med. St. Rasel Amoush.

Distribution. Sicily (*Monterosato*), Smyrna (*McAndrew*), Madeira (*Watson*); 16–49 fms.

4. Cerithiopsis barleei, Jeffreys.

C. barleei, B. C. iv. p. 268; v. p. 217, pl. lxxxi. f. 2.

'Porcupine' Exp. 1869: St. 9.

Distribution. British and Irish coasts, Arcachon (*Lafont*)!, Cap Breton (*De Folin*)!, Naples and Sicily (*Tiberi* and others)!; 25–40 fms.

[1] Whether it is the species which Mr. Watson proposed to name *diadema* may be questionable; but it quite agrees with the notice of that species given by Monterosato.

[2] Rough.

B. *Eumeta*, Mörch. Apex blunt.

5. Cerithiopsis metaxæ, Delle Chiaje.

Murex metaxa, D. Ch. Mem. iii. p. 222, t. xlix. f. 29–31.
C. metaxa, B. C. iv. p. 217 ; v. p. 217, pl. lxxxi. f. 4.

'Porcupine' Exp. 1870 : Atl. St. Vigo B., Tangier B. ; Med. 50, Rasel Amoush, Adventure Bank.

Distribution. Shetland to the Land's End, Gulf of Gascony, Mediterranean and Adriatic, Madeira, and Canaries ; 7–913 fms.

Fossil. Pliocene : Red and Coralline Crags, Biot, Pisa, Calabria, and Rhodes.

To the list of synonyms given in 'British Conchology' add *Cerithium rugulosum*, Sowerby, *C. subcylindricum*, Brusina, and *C. benoitianum*, Monterosato.

The description and figure of Delle Chiaje are unmistakable. Professor Martens says that the specific name ought to be *metaxæ*. He is right, and I have altered it accordingly.

A specimen from the Bay of Naples, which was obligingly given me by the late General de Stefanis, is almost needle-shaped, being much more slender and narrow than usual ; it has only three rows of tubercles on each whorl, the middle row being more prominent than the two others. The first or apical whorl is slightly twisted. Another specimen of the typical form is milk-white.

6. Cerithiopsis costulata, Möller.

Turritella? costulata, Möll. Ind. Moll. Grœnl. p. 10.
C. costulata, B. C. iv. p. 272 ; v. p. 217, pl. lxxi. f. 5.

'Lightning' Exp. St. 2, 5.

'Porcupine' Exp. 1869 : 4, 23*a*, 25, Rockall Bank, 65, 89, The Minch.

Distribution. Norway (*McAndrew* and others), Sweden (*Malm*), Shetland (*J. G. J.*), between the Hebrides and Faroes ('Triton' Exp.), Iceland (*Torell*), off C. Farewell ('Bulldog' Exp.), Greenland (*Möller*), G. St. Lawrence (*Whiteaves*), B. Fundy (*Verrill*); 82–1622 fms.

Fossil. Post-tertiary (*J. G. J.* and *Thorburn*), Wick (*Peach*), Co. Antrim (*Hyndman*, *Waller*, and *J. G. J.*) ; 60 feet to 25 fathoms.

Cerithium arcticum, Mörch, *Cerithiopsis nivea*, Jeffr., and *Cerithium naiadis*, Woodward.

7. Cerithiopsis trilineata, Philippi.

Cerithium trilineatum, Phil. Moll. Sic. i. p. 195, t. xi. f. 13 (1836).

'Porcupine' Exp. 1870 : Atl. St. 30 (young).

Distribution. Throughout the Mediterranean, and the north-eastern coasts of the United States of America ; below low-water mark to 20 fathoms.

Fossil. Miocene : North-west Germany, Vienna Basin and North America (*Otto Meyer*). Pliocene : Red and Coralline Crags, Italy, Rhodes, and Madeira.

Having myself seen this remarkable species dredged off Martha's Vineyard on the New-England coast, and carefully compared it with the Mediterranean and fossil species, I cannot find the slightest difference between any of the specimens. It is the *Cerithium terebrale* of C. B. Adams, Bost. Journ. N. H. iii. pl. 3. f. 7 (1841). The occurrence of this European species not merely on the coasts of North America but also in the Miocene formation of both countries is remarkable.

The last whorl has a basal ridge or keel, besides a thread-like line below it and encircling the pillar. The apex consists of two or three smooth and glossy whorls ending in a globular point. There is the same very short canal as in *Cerithiopsis*; but the pillar is longer, more flexuous, and recurved at its base as in the typical species of *Cerithium*.

I have a fragment of a *Cerithiopsis* or *Cerithium* from Station 16 of the 'Porcupine' Expedition of 1870, which is worthy of notice. Each whorl has curved longitudinal ribs, which are crossed by two thread-like spiral striæ. It is figured in Plate VI. fig. 10 for future identification, and may be called *bizonalis* or *bizonale*.

Summary of the foregoing Mollusca.

	Families.	Genera.	No. of species.
XIX.	IANTHINIDÆ	IANTHINA	2
XX.	NATICIDÆ	NATICA	21
XXI.	NERITIDÆ	NERITINA	1
XXII.	SOLARIIDÆ	SOLARIUM	4
		ADEORBIS	4
		FOSSARUS	1
		SEGUENZIA	6
XXIII.	XENOPHORIDÆ	XENOPHORA	1
XXIV.	VELUTINIDÆ	LAMELLARIA	2
XXV.	CAPULIDÆ	CAPULUS	1
XXVI.	CANCELLARIIDÆ	TORELLIA	2
		TRICHOTROPIS	3
		CANCELLARIA	4
XXVII.	APORRHAIDÆ	APORRHAÏS	2
XXVIII.	CERITHIIDÆ	STILUS	1
		LÆOCOCHLIS	1
		CERITHIUM	10
XXIX.	CERITHIOPSIDÆ	TRIFORIS	2
		CERITHIOPSIS	7
		Total	75

EXPLANATION OF THE PLATES.

Plate IV.

Fig. 1, 1*a*. *Natica notabilis*, p. 31.
2, 2*a*. —— *subplicata*, p. 32.
3. —— *angulata*, p. 32.
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PLATE V.

Fig. 1, 1*a*. *Seguenzia elegans*, p. 42.
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PLATE VI.

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February 3, 1885.

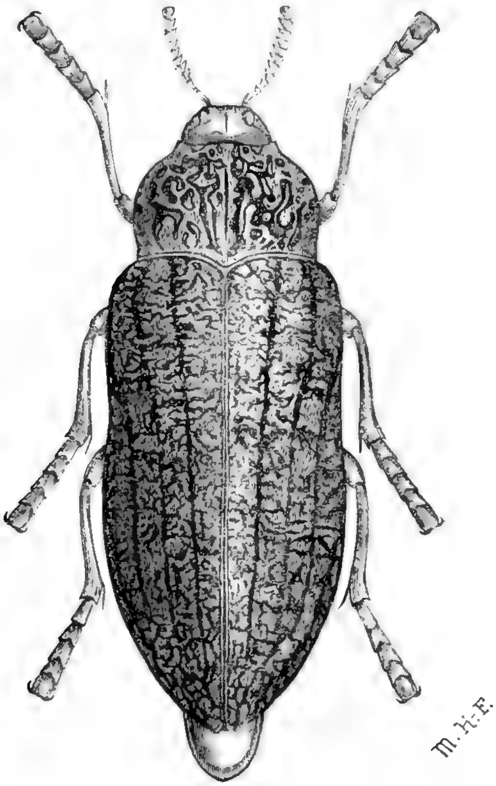
Prof. Flower, LL.D., F.R.S., President, in the Chair.

The Secretary exhibited a specimen of a rare South-American Lizard (*Heterodactylus imbricatus*), presented to the Society by Mr. G. Lennon Hunt, of 16 Hanover Square, late H.B.M. Consul at Rio, which had been obtained in the Montequeira Mountains near Rio; and read the following observations on it which had been kindly communicated to him by Mr. G. A. Boulenger, F.Z.S., of the Zoological Department, British Museum:—

"The handsome specimen obtained by Mr. Hunt belongs undoubtedly to Spix's *Heterodactylus imbricatus*. It is interesting, first as being larger than any specimen hitherto noticed, its length being 460 millim., in which the tail enters for 350 millim. Secondly, it possesses an elongate interparietal shield, which is in contact with the frontal anteriorly and with the first pair of occipitals posteriorly, a character which has been regarded as peculiar to the second species of the genus, *H. lundii*, Reinh. & Lütk. In the other specimens of *H. imbricatus* hitherto noticed, the interparietal is either altogether absent, or very short and enclosed between the parietals and the anterior occipitals. The specimen is a male, and shows on each side two præanal pores, on the right leg four femoral pores, and five on the left. The coloration of the upper parts is very obscure, the light lateral band characteristic of the species being hardly traceable."

The Secretary exhibited the type-specimen of a beetle of the family Buprestidæ remarkable for its large size, which had lately been described by Mr. Charles O. Waterhouse, of the British Museum (Ann. Mag. N. H. ser. 5, vol. xiv. p. 429), as *Julodis ffinchi*.

The specimen in question had been transmitted to the Society by Mr. B. F. Ffinch, of the Persian-Gulf Telegraph Service, Karachi, C.M.Z.S., and had been obtained at Bir, a small place on the Mekran coast of Beloochistan. Mr. Ffinch stated that he was



Julodis ffinchi.

endeavouring to procure more specimens, but that few of these insects had been met with in that locality.

The Secretary read the following extracts from a letter addressed to him by Dr. George Bennett, F.Z.S., dated Sydney, December 23, 1884:—

"I observe in the Society's 'Proceedings' (1884, p. 387), just received, a new Tree-Kangaroo (*Dendrolagus lumholtzi*) described from Northern Queensland. This has confirmed what I had long suspected, that there was one to be found there. You may recollect that in the 'Proceedings' for 1873 (p. 518), I mentioned the supposed existence of a species of Tree-Kangaroo (*Dendrolagus*) in Northern Queensland, some such animal being apparently well known to the blacks of Cardwell, who report that it is a Kangaroo that climbs trees and leaves deep scratches on the bark. I heard of such an animal from many other sources when in Queensland, and made many endeavours to obtain it dead or alive, but was unsuccessful, so I was glad to find that one had been at last obtained by the Norwegian naturalist. I may further remark that the size and deep scratches observed on the bark of the trees, gave rise to a report that a tiger-like animal was to be found in Northern Queensland [1], as no one believed that Kangaroos could climb trees, being ignorant of the existence of arboreal Kangaroos in New Guinea. Besides, the scratches were totally different from those of the Opossum, which leaves marks as if made with a pin's point, being very fine, and there is some doubt whether the Koala or Native Bear leaves any marks."

The Secretary laid upon the table a series of specimens of Lepidopterous insects, which had been bred in the Insect House during the past season, and read the following report upon the subject drawn up by Mr. A. Thomson :—

The following species of Insects have been exhibited in the Insect House during the past season :—

Silk-producing Bombyces.

Indian.

Attaeus atlas.	*Actias selene.*
—— *cynthia.*	*Antheræa mylitha.*
—— *ricini.*	

American.

Samia cecropia.	*Telea promethea.*
*—— *columbia.*	—— *polyphemus.*

Diurnal Lepidoptera.

Papilio machaon.	*Vanessa urticæ.*
—— *podalirius.*	—— *polychlorus.*
Thais polyxena.	—— *cardui.*
Pieris daplicide.	—— *levana.*
Arge galathea.	**Melitæa artemis.*
**Aporia hippia.*	**Argynnis euphrosyne.*
Vanessa atalanta.	—— *paphia.*
—— *antiopa.*	*Limenitis sibylla.*
—— *io.*	—— *populi.*

Nocturni.

Smerinthus ocellatus.	*Liparis monacha.*
—— *populi.*	*Bombyx quercus.*
—— *tiliæ.*	*Lasiocampa ilicifolia.*
Sphinx ligustri.	*Eudromis versicolor.*
—— *pinastri.*	*Saturnia carpini.*
Deilephila euphorbiæ.	*Amphydasis betularia.*
—— *livornica.*	*Eupithecia pulchellata.*

* Exhibited for the first time.

[1] *Cf.* P. Z. S. 1871, p. 629; 1872, p. 355; 1873, p. 518.

**Chærocampa nerii.*	*Melanippe hastata.*
Zygæna filipendulæ.	*Cidaria sagittata.*
Euchelia jacobææ.	*Cilix spinula.*
Callimorpha dominula.	*Dicranura vinula.*
Chelonia caja.	*Thyatira batis.*
Liparis dispar.	**Gonomita postica.*

Of the insects mentioned in the preceding list, I have the honour to exhibit specimens of all the silk-producing Bombyces reared during the past year. Of these I succeeded in rearing a second brood of *Attacus cynthia* and *Samia cecropia*; but I could not succeed in obtaining fertile ova from any of the other species, although I made every effort to do so. I fear that the little red ants, which infested the Insect House during the past year to an extraordinary degree, had something to do with this failure, as with every care that was taken to keep them out of the cases, a few managed to get in and worry the insects.

Amongst these insects are three interesting varieties, two (male and female) of *Samia cecropia*, and one of *Attacus ricini*. The female of *Samia cecropia* emerged in 1882, and I put it on one side to see if any more would emerge, but none appeared at all like it till the past year, when a very fine male emerged. Compared with the ordinary type of *S. cecropia* the difference is rather striking. The specimen of *Attacus ricini* is remarkable for the absence of the dark-coloured markings on the wings, and for the breadth of the rose-coloured band.

Of Butterflies, the most interesting species exhibited was *Aporia hippia* from the Amoor, cocoons of which were received in exchange from the Gardens in Hamburg.

I was able to exhibit for the first time during the past year the very beautiful Oleander Hawk-Moth (*Chærocampa nerii*), pupæ of which were obtained from the continent.

From South Africa I received some cocoons, sent by Mr. E. T. Wells, of Somerset East. These proved to be the cocoons of *Gonomita postica*; and I exhibit a male and female insect, together with the cocoons from which they emerged.

Mr. Seebohm exhibited an example of a curious pale-buff variety of the Red Grouse, *Tetrao scoticus*, which had been shot on the 16th of October, 1884, by Mr. Gray Grayrigge, on a moor near Morecambe Bay. It had been seen during three seasons on the moor.

The following papers were read:—

* Exhibited for the first time.

J. Smit lith. Hanhart imp.

1. ODONTORHYNCHUS BRANICKII.
2. SYNALLAXIS SINGULARIS.

J. Smit lith.

Hanhart imp.

UROTHRAUPIS STOLZMANNI.

1. Troisième liste des Oiseaux recueillis par M. Stolzmann dans l'Ecuadeur. Par L. Taczanowski et Comte H. v. Berlepsch.

[Received January 9, 1885.]

(Plates VII. & VIII.)

Les oiseaux de cette collection ont été recueillis dans les localités suivantes:—

"Mapoto (province Ambato, canton Pillaro[1], paroisse Baños), hacienda située sur le versant oriental des Andes, couvert de forêts humides, sur la route entre Baños et Canelos, cette dernière localité visitée par M. Buckley. Mapoto est établi au bord du fleuve Pastaza, le plus important confluant équatorien de l'Amazone. Cette localité est élevée à 7000 pieds au dessus du niveau de la mer, correspondant sous ce rapport à Cayandeled du versant occidental; mais malgré cela sa faune doit être plutôt comparée à celle de Chimbo.

"Machay, hacienda située sur la même route à une distance de trois lieues de Mapoto. Son élévation est 5000 pieds au dessus du niveau de la mer. Le caractère de la végétation est presque le même que dans la localité précédente, et les faunes y sont très semblables, quoique on rencontre à Machay plusieurs espèces qu'on ne trouve pas à Mapoto, et *vice versâ*.

"Baños, chef-lieu de la paroisse du même nom (province Ambato, canton Pillaro), situé sur le versant N.E. du volcan Tunguragua, à une hauteur de 6200 pieds au dessus du niveau de la mer. Les oiseaux cités de cette localité ont été recueillis un peu plus haut, dans le forêt Runtun, entre 6500 et 7500 pieds.

"San Rafael, hacienda sur le versant E. du volcan Tunguragua, élevée à 9000 pieds, les excursions y étaient poussées jusqu'à la limite inférieure des neiges éternelles, c'est-à-dire jusqu'à une hauteur de 15,000 pieds. La forêt s'y étend entre 9000 et 11,500 pieds, au dessus de cette hauteur on entre dans la région de "Paramo," caractérisée par le manque de la végétation arborescente remplacée par les graminées, principalement par la *Stipa ichu* et par les arbustes de la *Chuquiragua insignis*. On a chassé aussi un peu au dessous de San Rafael jusqu'à la hauteur de 5000 pieds, où les forêts primitives ont été détruites, et une végétation serrane y a pris place.

"Mayorazgo, d'où proviennent les *Steatornis*, est une petite grote située dans un ravin presque inaccessible voisin de San Rafael. Elle est élevée à 9000 pieds au dessus du niveau de la mer.

"Riobamba, ville, chef-lieu de la province Chimborazo, située dans une vaste plaine entre les deux crêtes des Cordillères, occidentale et orientale. Les eaux des environs de la ville appartiennent

[1] Il faut distinguer Pillaro de Puellaro, bourg situé près de Quito et visité par M. Fraser dans son voyage dans l'Ecuadeur.

au système du fleuve Pastaza. Riobamba est donc située sur le versant oriental de la chaine des Andes. L'altitude de cette ville est à peu près la même que celle de Quito (9000 pieds). La végétation, outre les champs cultivés, y est très pauvre et se compose principalement des arbres du cerisier américain (*Cerasus capuli*), d'une espèce d'Agave et d'un Cactus à fleurs blanches, très recherchées par la *Lesbia amaryllis*.

"Les localités citées jusqu'ici sont situées sur le versant oriental des Andes. La comparaison de leurs faunes avec celles du versant occidental exploré par moi et Siemiradzki nous montre que Mapoto et Machay correspondent à Chimbo du versant occidental, Baños à Cayandeled, et San Rafael à Cechce et la Union.

"Mapoto et Machay, quoique élevés beaucoup plus que Chimbo, présentent plusieurs espèces communes, ou très voisines aux espèces de Chimbo, comme par exemple:—

Chimbo (entre 800 et 3000 pieds).	*Mapoto et Machay* (entre 4000 et 5000 pieds).
Cyphorhinus phæocephalus.	C. thoracicus dichrous.
Geothlypis semiflava.	G. philadelphia.
Basileuterus semicervinus.	B. tristriatus.
Hylophilus minor.	H. olivaceus.
Calliste cyanopygia.	C. cœruleocephala.
Pyranga ardens.	P. ardens.
Chlorospingus canigularis.	Ch. signatus.
Chlorospingus flavigularis.	Ch. flavigularis.
Cassicus.	C. uropygialis.
Platyrhynchus albigularis.	P. albigularis.
Todirostrum sclateri.	T. cinereum.
Mionectes oleagineus.	M. oleagineus.
Leptopogon superciliaris.	L. pœcilotis.
Tyranniscus cinereiceps.	T. cinereiceps.
Myiozetetes cayennensis.	M. similis.
Rhynchocyclus peruvianus.	Rh. peruvianus.
Myiobius crypterythrus.	M. cryptoxanthus.
Contopus richardsoni.	C. richardsoni.
Tyrannus melancholicus.	T. melancholicus.
Cephalopterus penduliger.	C. ornatus.
Xenops littoralis.	X. rutilus.
Sittasomus amazonus.	S. amazonus.
Margarornis brunnescens.	M. brunnescens.
Dysithamnus semicinereus.	D. subplumbeus.
Myrmotherula menetriesii.	M. menetriesii.
Cercomacra tyrannina.	C. approximans?
Schistes personatus.	S. geoffroyi.
Picumnus granadensis.	P. lafresnayei.
Momotus microstephanus.	M. sp.?[1]
Galbula melanogenia.	G. pastazae.
Malacoptila panamensis.	M. fulvigularis.
Rhamphastos ambiguus.	Rh. tocard.
Capito bourcieri.	C. bourcieri.

"Nous n'avons choisi que les espèces très caractéristiques pour Chimbo (800–3000 pieds), ne dépassant point cette dernière altitude.

[1] J'ai vu un exemplaire chez un chasseur de Machay, probablement *M. brasiliensis*.

Ces exemples démontrent un fait très remarquable, que les limites de la dispersion orographique sont beaucoup plus basses pour plusieurs espèces sur le versant occidental que sur le versant oriental, ce qui paraît prouver que les mêmes lignes isothermiques ne sont pas situées sur la même hauteur des deux versants des Andes dans la même latitude géographique. Quelques données du règne végétal viennent à confirmer notre supposition; par exemple, le bambou épineux (*Guadua*, sp.?) ne se trouve pas au dessus de Chimbo (800 pieds), tandis qu'il est répandu à Machay et à Mapoto sur 4000–5000 pieds. D'un autre côté on rencontre à Chimbo une canne grimpante (*Chusquea*) propre sur le versant oriental à des hauteurs de 7000 à 9000 pieds, et ne se trouvant pas à Machay (5000 pieds).

"Quoique l'exploration des environs de Baños fut très superficielle, la présence de quelques espèces très caractéristiques pour cette localité nous prouve qu'elle correspond plus ou moins à Cayandeled du versant occidental, malgré qu'elles présentent une différence de 2200 pieds dans leur élévation relative au dessus du niveau de la mer. Les formes suivantes si caractéristiques pour Cayandeled :—*Diglossa albilateralis, Pœcilotriccus rufigenis, Panoplites matthewsi, Bourcieria fulgidigula, Cynanthus cyanurus, Geotrygon bourcieri* se trouvent aussi à Baños, ou y sont remplacées par des espèces très voisines, comme p. e. *Pœcilotriccus rufigenis* par *P. ruficeps, Bourcieria fulgidigula* par *B. torquata, Cynanthus cyanurus* par *C. mocoa.*

"Chimborazo, montagne située sur la crête des Cordillères, de manière qu'une partie de ses eaux se rend vers le Pacific, formant la rivière Chimbo, confluant du fleuve Guayas (Guayaquil), et l'autre vers l'Atlantique par la rivière San Luis, un des nombreux cours d'eaux formant le fleuve Pastaza. Les oiseaux provenant du Chimborazo ont été chassés aux environs de Panza, petit tambo (auberge) visité autrefois par M. Fraser, qui estime son élévation à 14,000 pieds.

"Les deux dernières localites qui ont été précédemment visitées par Stolzmann et Siemiradzki sont:—

"La Union ou Llagos, petit village composé de quelques cabanes sur la grande route d'Alausi à Cuenca. Les oiseaux y ont été chassés entre les limites de 8000 et 9000 pieds. Cette localité du versant occidental correspond par son élévation et par sa faune à San Rafael du versant oriental. Toute cette contrée est couverte de forêts humides.

"Yaguachi, ville, élevée après la dernière révolution au rang du chef-lieu d'un nouveau canton Olenedo, formant une partie de la province Guayas (Guayaquil). Elle est située au bord de la rivière Yaguachi, confluant du fleuve Guayas, à une distance de 6 lieues de Guayaquil. Son élévation est presque nulle, et le climat y est très chaud. La végétation des environs de Yaguachi présente une remarquable transition entre les forêts humides des contreforts des Andes et la végétation relativement très pauvre des environs de Guayaquil. Pendant les deux saisons de l'année, celle des pluies et celle de la sécheresse, on remarque une différence assez considérable dans la végétation ; elle est pauvre pendant la sécheresse, et se développe beaucoup plus lorsqu'il commence à pleuvoir. Ces changements climatériques et phytologiques entraînent une sorte de migrations des oiseaux de la côte équatorienne, et tandis qu'on y rencontre dans la saison sèche plusieurs espèces caractéristiques pour Guayaquil, on y trouve dans l'époque des pluies plusieurs formes propres aux forêts humides des environs de Chimbo. Ainsi, p. e., j'y ai trouvé en décembre (fin de la saison sèche) le *Pyrocephalus rubineus, Myiodynastes bairdi, Coryphospingus cruentus,* etc., en nombre assez considérable, tandis qu'ils manquaient complètement au mois de mai (fin de la saison pluvieuse), et au lieu d'eux j'ai trouvé les espèces non vues auparavant :—*Myiodynastes audax, Euphonia saturata, Hadrostomus homochrous, Pachyramphus spodiurus, Juliamyia feliciana,* etc."—*Stolzmann.*

TURDIDÆ.

*1. TURDUS ALICIÆ, Baird.

Une femelle prise à Machay en novembre. L'oiseau n'est pas adulte, présentant quelques stries blanches sur les grandes tectrices alaires, et d'un faîte un peu moins fort que les oiseaux des Etats Unis et de Bogota (Musée Berlepsch) et du nord de Kamtschatka (Musée de Varsovie), avec lesquels il a été comparé, s'accordant en outre parfaitement avec tous ces exemplaires.

2. TURDUS SWAINSONI, Cab.

Neuf exemplaires de Mapoto et Machay, recueillis depuis novembre jusqu'en janvier.

*3. TURDUS EURYZONUS, Du Bus.

Un oiseau sans indication de sexe recueilli à Machay le 14 novembre. Iris brun foncé. 5^e remige la plus longue, $4^e=6^e$, $2^e=9^e$, longueur de la 1^{re} 30 millim.

4. TURDUS SERRANUS, Tsch.

Une paire de Machay et de Mapoto, recueillie en décembre et janvier. Iris brun foncé.

Le mâle, qui est jeune prenant sa livrée d'adulte, présente les dimensions moins fortes que celles des mâles du Pérou central ; l'aile pliée est longue de 120, tandis qu'elle est de 133 chez le péruvien, queue de 105 au lieu de 117 millim. La formule de l'aile est la même. La femelle, qui est adulte et en plumage, a aussi les dimensions moins fortes que dans les péruviennes, aile longue de 118 au lieu de 123–126, queue 105 au lieu de 110 millimètres. Dans la coloration elle est plus foncé en dessus que les péruviennes ; en dessous et sur les tectrices inférieures de l'aile le roux est olivâtre et non rougeâtre propre aux oiseaux péruviens.

*5. TURDUS GIGAS, Fras.

Une femelle tuée en février à Baños.

CINCLIDÆ.

*6. CINCLUS LEUCONOTUS, Scl.

Une paire de San Rafael recueillie en mars 1881. Iris brun foncé.

SYLVIIDÆ.

7. MYIADESTES RALLOIDES (Lafr. et d'Orb.).

Mâle et deux femelles recueillis en février à Mapoto. Iris brun grisâtre.

*8. POLIOPTILA BILINEATA (Bp.).

Mâle, femelle et un jeune mâle de Yaguachi recueillis en août. Iris brun foncé.

Cette forme se distingue de la *P. albiloris*, Salv., par la strie sourcilière blanche ; c'est à cette forme qu'appartient aussi l'oiseau du Pérou septentrional.

TROGLODYTIDÆ.

9. CAMPYLORHYNCHUS BALTEATUS, Baird.

Trois femelles adultes et un jeune de Yaguachi, recueillis en mai 1881.

Le jeune oiseau en premier plumage diffère des adultes par le sommet de la tête noir unicolore bordé des deux côtés d'un sourcil ocreux clair, très fin devant l'œil et élargi en arrière ; toutes les taches dorsales, les bandes alaires et caudales ocreuses au lieu de blanchâtres ; en dessous le blanchâtre est sale à taches moins grandes et moins régulières. La mâchoire est d'un brun beaucoup plus foncé ; les pattes plus obscures.

*10. CINNICERTHIA UNIBRUNNEA (Lafr.).

Trois mâles et une femelle de Machay, Mapoto et San Rafael, tués en décembre, en janvier et février. Iris gris bleuâtre chez le mâle, brun châtain chez la femelle.

*11. CYPORHINUS THORACICUS DICHROUS (Scl. et Salv.), P.Z.S. 1879, p. 792, tab. xli.

Deux mâles, trois femelles et quatre jeunes recueillis à Machay et Mapoto en novembre et janvier. Iris brun foncé.

Forme très voisine du *C. thoracicus*, Tsch., qui n'en est distincte que par des détails très minutieux, comme couleur générale des parties supérieures du corps plus foncée et disposée d'une manière différente sur le derrière du sommet de la tête en descendant largement en travers de toute la longueur du cou, tandis que dans l'oiseau péruvien elle s'attenue graduellement sur la nuque et passe finement au cou ; le roux intense de la poitrine s'arrête plus haut, mais il descend en une nuance plus claire plus loin sur le milieu de l'abdomen ; les sous-caudales sont bordées largement de roux et traversées par une autre raie parallèle à cette bordure, tandis que chez le *C. thoracicus* la bordure roussâtre est peu prononcée et il n'y a point de trace d'une raie parallèle ; le devant du visage présente aussi une différence en ce que le roux commence immédiatement au menton et passe au dessous de l'œil, les plumules foncées ne se trouvant que sur la bordure de la paupière, tandis que chez l'oiseau péruvien le brunâtre occupe le devant du menton, et l'œil est entouré d'une bordure pareille assez large ; le bec est plus bossu devant les narines.

Les oiseaux jeunes se distinguent des adultes par une teinte brunâtre sur les parties supérieures du corps, le roux de la gorge moin pur et moins uniforme, les souscaudales rousses en entier, la mandibule blanche en dessous.

12. Henicorhina leucophrys (Tsch.).

Deux femelles de Machay, prises en décembre 1883, identiques à l'oiseau de Chimbo, à poitrine paraissant être d'un gris un peu plus clair.

13. Odontorhynchus branickii, sp. n. (Plate VII. fig. 1.)

O. *supra cinereo-ardesiacus, pileo plus aut minus rufescente induto, uropygio maculis nonnullis albis vario, tectricibus caudæ superioribus nigro transfasciatis ; lateribus capitis albo et nigro striatis ; subtus totus albus, tectricibus caudæ inferioribus fasciis transversalibus nigris ; alis dorso concoloribus, subalaribus albis fusco maculatis ; margine interno remigum albo ; cauda ardesiaco-cinerea, fasciis transversalibus nigris ; rectricibus externis nigris, fasciis albis.*

♂ ad. Tout le dessus du corps est d'un cendré ardoisé pur à sommet de la tête roussâtre, presque ocreux sur le front, jusqu'au delà du niveau du devant des yeux et prenant un ton café sur le reste ; des stries blanches nombreuses au cou postérieur, quelques taches blanches au milieu du croupion, tectrices supérieures de la queue rayées en travers de noir ; côtés de la tête blancs striés finement de noir ; sourcils noirs striés de blanc ; tout le dessous est blanc, coloré légèrement d'isabelle sur la poitrine, des raies noires en travers des souscaudales. Ailes concolores au dos à tectrices inférieures blanches maculées de gris foncé ; bord interne des remiges blanc. Queue d'un cendré plus clair que celui du dos et des ailes, transversée de huit raies noires, dont les deux postérieures sont largement interrompues au milieu des rectrices ; en outre les rectrices sont terminées par une bordure noirâtre entourée d'un liséré cendré très fin ; les bandes noires sont prédominantes sur les rectrices externes, et les cendrées remplacées par des blanches, sur la rectrice suivante il y a une série de taches blanches le long du bord interne. Bec gris corné très foncé, presque noir, plus clair sur les fourches de la mandibule et sur les bords des deux mâchoires ; pattes plombé foncé ; iris brun rougeâtre.

♀ ad. Semblable en tout au mâle précédent et n'en diffère que par l'ocreux moins clair et moins prolongé sur le front et le manque complet de stries blanches au cou postérieur.

Jeune mâle semblable aux adultes et en diffère principalement par la couleur du sommet de la tête à peine lavé de café de sorte que la nuance de cette partie est très peu différente de celle du dos; également comme la femelle, il n'a point de stries blanches au cou postérieur; les stries blanches des côtés de la tête plus grosses, moins nombreuses, à bordures latérales moins foncées, les stries du sourcil sont sur un fond ardoise et non noir; souscaudales d'un blanc isabelle à raies transversales noires, moins régulières et moins nettes. Iris gris foncé.

♂. Longueur totale 143, vol 196, aile 60, queue 54, bec 17·5, tarse 17, doigt médian 13, ongle 5, pouce 12, ongle 6·5 millim.

♀. Longueur totale 136, vol 188, aile 57, queue 50, bec 17, tarse 17, doigt médian 13, ongle 4, pouce 11, ongle 6 millim.

L'oiseau typique du Musée de Vienne de l'*O. cinereus*, Pelz., est jeune en premier plumage, mais malgré cela il est suffisant pour démontrer évidemment que notre oiseau de l'Ecuadeur appartient à une espèce parfaitement distincte, quoique voisine, tant plus que parmi les oiseaux fournis par M. Stolzmann il y a un exemplaire jeune. La forme du bec présente une différence la plus frappante; dans notre oiseau il est beaucoup plus long, moins élevé, moins comprimé, à arête dorsale beaucoup moins courbée dans sa moitié terminale; les pattes de notre oiseau sont beaucoup plus fortes, à doigts plus longs, la différence est la plus frappante dans le pouce, qui n'est que de 8 millim. dans l'espèce brésilienne; les ailes sont plus longues de 9–10 millim., à 4^{e} et 5^{e} remiges les plus longues et égales, tandis que dans l'oiseau brésilien c'est la 3^{e} et 7^{e} qui sont égales et les plus longues. Dans la coloration il y a aussi plusieurs différences essentielles outre celle de la nuance des parties supérieures du corps, comme:—côtés de la tête striés d'une manière plus ou moins prononcée, même dans l'oiseau jeune, les raies noires plus larges et moins nombreuses en travers de la queue (8 au lieu de 11).

Deux mâles, deux femelles et un jeune mâle de Machay et de Mapoto, recueillis en décembre et en janvier.

Ce Troglodyte accompagne les bandes vagabondes dans les forêts de la contrée; ses allures bizarres ont frappé l'attention de M. Stolzmann, car il a l'habitude de sautiller à grands bonds le long des grosses branches horizontales, également sur leur surface supérieure, comme sur l'inférieure; et c'est cette manœuvre qui le faisait reconnaître de loin dans une bande composée de différents autres oiseaux.

Nous dédions ce curieux oiseau à la mémoire du Comte Constantin Branicki comme souvenir du dernier voyage de M. Stolzmann accompli sous ses auspices.

14. THRYOTHORUS EUOPHRYS, Scl.

Une femelle prise à La Union le 27 octobre.

15. TROGLODYTES SOLSTITIALIS, Scl.

Cinq femelles et trois jeunes pris à Baños, San Rafael et El Mirador en janvier et février.

16. TROGLODYTES FURVUS (Gm.).

Un exemplaire de Yaguachi.

MOTACILLIDÆ.

17. ANTHUS BOGOTENSIS, Scl.

Mâle ad. et jeune de San Rafael et de Chimborazo, recueillis en mars et en avril.

MNIOTILTIDÆ.

18. PARULA PITIAYUMI (Vieill.).

Un mâle de Mapoto, une femelle de Machay.

Le mâle a les deux raies blanches transalaires très marquées, la femelle n'a qu'une faible raie postérieure et manque en entier l'antérieure. Ce mâle a le roussâtre du cou antérieur aussi faible que dans les femelles de Chimbo et de Machay, tandis que les mâles de Chimbo et de Surupata (Ecuadeur occ.), ainsi que ceux du Pérou septentrional, ont cette nuance beaucoup plus forte.

19. DENDRŒCA BLACKBURNIÆ (Gm.).

Neuf oiseaux en différents plumages, pris à Machay, Mapoto et Baños depuis novembre jusqu'en janvier.

*20. DENDRŒCA CÆRULEA (Wils.).

Huit oiseaux pris à Machay et à Mapoto depuis novembre jusqu' en février.

*21. MYIODIOCTES CANADENSIS (L.).

Onze oiseaux pris à Machay et Mapoto depuis novembre jusqu'en février.

22. GEOTHLYPIS PHILADELPHIA (Wils.).

Quatre mâles et une femelle de Mapoto recuillis en janvier. Iris brun foncé.

Tous les mâles n'ont aucune trace de blanc sur les paupières.

*23. BASILEUTERUS CASTANEICEPS, Scl. et Salv., P. Z. S. 1877, p. 521 (décrit de Jina, Ecuad.).

Trois mâles et une femelle, pris à Machay et San Rafael en décembre et mars. Iris brun foncé.

Les oiseaux péruviens ont une teinte plus brunâtre et moins olive en dessus, et ont le plus souvent moins de jaune sur les sous-caudales.

24. BASILEUTERUS TRISTRIATUS (Tsch.).

Trois mâles, deux femelles et deux oiseaux sans indication de sexe, pris à Machay et à Mapoto en novembre, décembre et janvier. Iris brun foncè.

Ces oiseaux ne se distinguent des péruviens que par le jaune plus distinct à la surface de la raie médiane du sommet de la tête.

25. BASILEUTERUS NIGRICRISTATUS (Lafr.).

Deux oiseaux pris en février et en mars à San Rafael. Iris brun foncé.

26. SETOPHAGA VERTICALIS (Lafr. et Orb.).

Cinq exemplaires de Mapoto et de Machay, pris en novembre, décembre et janvier.

27. SETOPHAGA BAIRDI, Salv.

Cinq exemplaires de San Rafael et de Mapoto, pris en janvier et février.

Le jeune oiseau en premier plumage n'a rien de roux sur la nuque, rien de jaune sur les lores et autour de l'œil ; le dessous est d'un jaunâtre sale et pâle avec une large bande pectorale roussâtre.

*28. SETOPHAGA RUFICORONATA, Kaup ; Salv. Ibis, 1878, p. 316, tab. vii. f. 1.

Deux mâles de San Rafael pris en février et mars. Iris brun foncé.

VIREONIDÆ.

29. VIREOSYLVIA JOSEPHÆ, Scl.

Un mâle et trois femelles recueillis à Machay, à Mapoto et Baños en novembre, décembre et février.

*30. HYLOPHILUS OLIVACEUS, Tsch.

Un mâle pris à Mapoto en décembre. Iris ocreux. Identique aux oiseaux péruviens.

HIRUNDINIDÆ.

31. STELGIDOPTERYX UROPYGIALIS (Lawr.).

Deux oiseaux de Yaguachi.

CŒREBIDÆ.

32. DIGLOSSA PERSONATA (Fras.).

Trois mâles et une femelle recueillis à Baños en février 1884.

*33. DIGLOSSA LAFRESNAYI (Boiss.).

Un mâle et deux femelles recueillis en mars 1877 à San Rafael. Iris brun foncé.

*34. DIGLOSSA INDIGOTICA, Scl.

Un mâle ad., deux femelles et un jeune mâle recueillis à Mapoto en janvier et février 1884. Iris jaune chez le mâle, d'un jaune sale chez la femelle et le jeune.

35. DIGLOSSA ALBILATERALIS, Lafr.

Un mâle adulte pris à Baños en février 1884.

*36. CONIROSTRUM SITTICOLOR, Lafr.

Trois mâles ad. et un jeune mâle de San Rafael, recueillis en mars 1884. Iris brun foncé.

37. CONIROSTRUM FRASERI, Scl.

Un mâle de San Rafael du 28 février, 1884.

*38. OREOMANES FRASERI, Scl. P. Z. S. 1860, p. 75.

Une paire de Chimborazo, recueillie le 20 Avril, 1884. Iris brun foncé.

Les deux sexes ne présentent entre elles aucune différence, excepté la taille, qui est moins forte dans la femelle ; l'aile du mâle a 88 millim., celle de la femelle 81, queue du mâle 65, celle de la femelle 60.

*39. DACNIS PULCHERRIMA AUREINUCHA, Ridgw. Proc. U.S. National Mus. 1878 (Ecuador).

Deux mâles, trois femelles et un jeune recueillis à Machay en novembre et décembre. Iris rouge brunâtre chez le mâle, brun rougeâtre chez la femelle ; brun foncé chez le jeune.

La femelle a le noir de la tête et du dos remplacé par l'olive avec un demicollier nucal analogue à celui du mâle, mais d'un jaune obscur, une raie d'un jaune straminé à éclat vitreux le long du milieu du dos, croupion d'un jaune plus pur et plus brillant ; gorge d'un gris olivâtre, bordée en dessous d'une raie jaune vive, prolongé sur les côtés jusqu'à compléter le demicollier nucal dont le jaune est beaucoup plus obscur ; le milieu même du dessous du corps est blanchâtre, côtés largement d'un olive jaunâtre, passant même au jaune sous certain jour. Ailes noirâtres à tectrices et les remiges bordées de bleu verdâtre ; les remiges tertiaires de la couleur du dos ; sous-axillaires blanc-jaunâtres. Rectrices médianes olives, les autres noirâtres bordées à l'extérieur de bleu verdâtre.

Une femelle plus jeune se distingue de la précédente par le collier nucal plus fin et moins prononcé, le croupion moins jaune, la raie dorsale peu marquée, la partie antérieure du collier moins large, et d'un jaune moins brillant, les flancs olivâtres sans éclat jaune.

Le jeune en premier plumage diffère de la femelle par le collier nucal à peine indiqué par une ligne un peu plus claire que le fond des parties environnantes, par le manque complet de taches jaunâtres le long du milieu du dos, le jaune olivâtre occupant le milieu du croupion moins largement et sans éclat vitreux ; en dessous il est beaucoup plus sale, à milieu du ventre jaunâtre sale au lieu de blanchâtre ; très peu de jaunâtre au cère antérieur ; tectrices alaires olives au lieu de bleuâtre.

♂. Longueur totale 138, vol 219, aile 68, queue 45, bec 15, tarse 16 millim.

♀. Longueur totale 138, vol 217, aile 67, queue 17, bec 15, tarse 16 millim.

TANAGRIDÆ.

40. PROCNIAS CŒRULEA OCCIDENTALIS, Scl.

Deux mâles recueillis à Yaguachi en juin 1884.

41. EUPHONIA SATURATA (Cab.).

Quatre mâles et une femelle recueillis à Yaguachi en juin 1884.

*42. **Euphonia xanthogastra**, Sundev.

Un mâle ad., un jeune mâle et trois femelles recueillis à Machay en novembre 1883 et en janvier 1884.

43. **Euphonia hypoxantha**, Berl. et Tacz.

Un jeune mâle tué à Yaguachi en juin.

*44. **Chlorochrysa bourcieri** (Bp.), Rev. et Mag. Zool. 1851, p. 129 (décrit de Baños).

Nombreux exemplaires adultes et jeunes de Machay et de Mapoto, recueillis en novembre, décembre et janvier. Iris brun foncé.

Les oiseaux de l'Ecuadeur et de la Nouvelle Grenade diffèrent de la *Ch. calliparæa* (Tsch.) du Pérou central par la couleur de l'abdomen d'un bleu verdâtre, tandis que l'oiseau péruvien l'a d'un bleu saphiré intense.

Le jeune mâle en premier plumage ressemble en tout à la femelle adulte, mais il n'a point de tache occipitale jaune. En commençant à changer le plumage les plumes noires apparaissent sur la gorge, les vert-bleuâtres sur les flancs et au sommet de la tête; puis c'est le noir de la gorge et le plumage de la tête qui sont les premiers à se former, tandis que la coloration du dessous, les taches auriculaires et la grosse tache uropygiale sont encore à moitié incomplètes.

*45. **Diva vassori** (Boiss.).

Quatre mâles et une femelle pris à La Union en novembre 1883, et à San Rafael en mars 1881.

*46. **Calliste yeni** (Lafr. et Orb.).

Deux mâles pris à Machay en novembre et en décembre.

*47. **Calliste punctata** (L.).

Deux mâles pris à Machay et à Mapoto en novembre et en janvier.

*48. **Calliste pulchra æquatorialis**, Berl. MS.

Six mâles, deux femelles et un jeune en premier plumage de Machay et de Mapoto, recueillis en novembre, décembre et janvier.

Ces oiseaux se distinguent de ceux de l'espèce de Tschudi du Pérou central par le jaune en général plus pur et plus intense, fort orangé tirant presqu'au rougeâtre sur le sommet de la tête; le marron de la gorge et du cou antérieur est beaucoup moins obscur, le jaune de la poitrine et de l'abdomen est plus pur à nuance marron beaucoup plus faible.

Le jeune en premier plumage ressemble à l'adulte, mais il est mâte sans trace de lustre, le jaune est sale et uniforme partout sans orangé sur la tête ni marron sur la gorge; il a des petites taches noires au milieu du cervix formant une grosse tache foncée; le noir du tour du bec et de la tache auriculaire moins intense; bordures des plumes dorsales d'un jaune sale, ainsi que celles des tectrices alaires.

49. Calliste gyroloides (Lafr. et d'Orb.).

Une jeune femelle prise à Mapoto le 30 janvier.

*50. Calliste taylori, sp. n. Stolzm. MS.

C. *cæruleo-scladinea, alis caudaque nigris plumis cæruleo limbatis; abdomine medio crissoque albidis rufescente tinctis; fronte, loris, circulo oculari fasciaque cervicali et postnuchali nigris; fascia nuchali latissima splendide sericeo-aurea; area magna verticali fasciaque colli postici violaceo-ultramarinis; subalaribus albis. Rostrum nigrum; pedes plumbeo-olivacei; iris fusco-brunnea.*

♂. Le noir velouté occupe largement le front, les lores, le tour de l'œil, le devant du menton et une bande postnucale; une large bande d'un beau bleu outremer tirant un peu au violâtre occupe toute la largeur du vertex entre le noir frontal et celui de la raie cervicale; une large bande d'un jaune doré fort soyeux couvre la partie postérieure du cervix et la nuque en se prolongeant des deux côtés sur les tectrices auriculaires supérieures pénétrant même quelquefois sur le bord postérieur de l'œil; les plumes du cou postérieur sont noires terminées par une tache bleu-violâtre semblable à la couleur du vertex, qui sur le bas de cette partie paraissent former une bande continue; le dos est couvert de plumes noirâtres au milieu et bordées largement de vert céladon; croupion d'un beau bleu céladon uniforme, beaucoup plus clair et plus vif que celui des bordures dorsales; gorge, cou antérieur, joues, poitrine et les flancs de l'abdomen sont d'une couleur bleue semblable à celle du croupion; milieu de l'abdomen, région anale et les souscaudales d'un ocreux pâle, plus blanchâtre sur le devant. Ailes et queue noires à toutes plumes bordées de bleu analogue au plumage général, ces bordures sont larges sur les petites tectrices en y formant une surface uniforme, tandis qu'elles sont fines sur les autres; les deux rectrices médianes enduites de bleuâtre; sousalaires internes et les sousaxillaires blanches, les tectrices du pli de l'aile noirâtres squamulées de blanc. Bec noir; pattes d'un plombé olivâtre; iris brun foncé.

♀. Semblable au mâle et n'en est distincte que par la bande nucale moins brillante et moins large; la raie cervicale fine et moins nettement prononcée; les bordures des plumes dorsales moins pures; le bleu du croupion et du dessous moins intense et moins pur, surtout sur les flancs, où il est fort mélangé avec du gris.

Le jeune oiseau en premier plumage est d'un gris foncé olivâtre en dessus, lavé de verdâtre le long des côtés du sommet de la tête, au dos et surtout sur les scapulaires, le croupion et les couvertures supérieures de la queue, tandis que sur le milieu du cervix et de la nuque la nuance est brunâtre; gorge, joues, poitrine et les flancs sont d'un gris pâle; milieu de l'abdomen et les souscaudales semblables à ceux de l'adulte, mais d'une nuance sale. Les bordures des plumes alaires et de la queue sont d'une couleur moins pure; tectrices alaires moyennes fuligineuses sans bordures bleues; sur les petites les bordures sont d'un vert bleuâtre ne couvrant pas en entier le fond du milieu des plumes.

♂. Longueur de l'aile 78, queue 51, bec 14, tarse 18 mm.
♀. Longueur de l'aile 70, queue 49, bec 13, tarse 17 mm.

Forme la plus voisine de la *C. ruficervix*, Prev., et présentant la même disposition des couleurs, surtout sur la tête, mais distincte parfaitement par une autre couleur beaucoup plus brillante de la bande nucale, et plus prolongée sur les côtés jusqu'aux tectrices auriculaires supérieures, par une autre couleur bleue de la bande verticale, et les petites tectrices alaires (épaules) d'un bleu de ciel uniforme, tandis que chez la *C. ruficervix* elles sont d'un bleu foncé au moins en partie.

Trois mâles, ad., une femelle et un jeune en premier plumage pris à Machay en novembre et décembre.

M. Stolzmann dédie cette belle Calliste à M. Antoine Taylor, comme hommage pour son dévouement qu'il a déployé en lui aidant à collectionner pendant sa dernière expédition. Il accompagnait M. Fraser dans son expédition de Pallatanga et de Babahoyo, et ensuite il collectionnait pour M. Buckley.

51. Calliste cæruleocephala, Sws.

Cinq mâles, deux femelles et quatre jeunes de Machay et de Mapoto, recueillis en décembre, en janvier et février.

Ces oiseaux du versant oriental de la chaine équatorienne sont identiques aux oiseaux du Pérou septentrional, ayant la gorge d'un saphiré violâtre, et non à ceux du Pérou central et à ceux de l'Ecuadeur occidental.

Le jeune oiseau en premier plumage est en dessus d'un gris fuligineux à plumes du sommet de la tête et du cou bordées finement de vert olive donnant cette teinte assez prononcée à ces parties ; le croupion est d'une teinte olive jaunâtre sale ; la gorge est gris pâle tirant légèrement au verdâtre ; le reste du dessous est d'un gris pâle lavé légèrement de roussâtre au milieu du corps, et plus fortement sur les flancs du ventre, sur la région anale et les souscaudales ; le noir des ailes est moins intense, les bordures des remiges vertes, celles des tectrices fauves et celles des remiges tertiaires d'un fauve grisâtre ; les rectrices noirâtres sont bordées de verdâtre peu prononcé.

En commençant à changer le plumage c'est le croupion qui paraît prendre le premier la couleur semblable à celle des adultes, les plumes bleues se montrent au cou et sur la tête, les noires au dos et sur l'abdomen.

*52. Calliste melanotis, Scl.

Deux femelles prises à Machay en novembre et décembre, semblables en tout aux oiseaux du Pérou septentrional et ne distinctes de l'oiseau du Pérou central que par la teinte de la gorge moins jaunâtre.

*53. Calliste chrysotis, DuBus.

Un mâle, quatre femelles et un jeune recueillis à Machay en novembre. La femelle de cet oiseau est aussi brillante que le mâle et ne présente aucune différence dans la coloration.

Le jeune oiseau en premier plumage a la même disposition des couleurs que dans les adultes, mais il est beaucoup moins brillant, surtout sur le dessous du corps, où le vert de la gorge et de la poitrine est faible, celui des flancs très peu indiqué ; le doré beaucoup plus faible sur la bande auriculaire ; le noir est partout moins intense et moins pur, le roux du dessous moins foncé. Bec corné brunâtre ; pattes carnées.

54. Calliste venusta, Scl.

Trois mâles et une femelle de Machay recueillis en novembre.

*55. Iridornis dubusia (Bp.).

Un mâle pris à San Rafael le 5 mars, 1884. Iris brun rougeâtre.

*56. Pœcilothraupis lunulata atricrissa, Cab.

Cinq mâles et deux femelles pris à San Rafael en mars, sans aucune trace de bordures rouges sur les souscaudales.

*57. Pœcilothraupis palpebrosa (Lafr.).

Un mâle et deux femelles de San Rafael pris en mars. Iris noir.

Ces oiseaux sont intermédiaires entre la *P. palpebrosa* vraie de Bogota et d'Antioquia et les oiseaux du Pérou septentrional (Cutervo), plus proches aux derniers. Ils ont les côtés de la tête lavés d'olive comme les oiseaux typiques, mais sur un fond plus foncé, tandis que le plumage du sommet de la tête et de toutes les parties supérieures du corps enduits de bleu, moins fortement que dans les *P. lacrymosa*. Ce sont les oiseaux appartenant à la subsp. *cærulescens*, Berl. MS.

*58. Buthraupis cucullata (Jard.).

Une femelle de San Rafael prise en mars. Iris rouge brique.

Oiseau identique à ceux de Bogota ; les oiseaux du Pérou central sont d'une taille un peu moins forte, ils ont le bec moins long et plus comprimé à l'extrémité, à arête dorsale plus courbe ; dans la coloration ils ne présentent aucune différence. Cette femelle a les dimensions suivantes. Longueur de l'aile 135, queue 100, bec 25 mm.

*59. Buthraupis chloronota, Scl.

Trois paires de San Rafael prises en mars. Iris brun foncé.

*60. Compsocoma victorini (Lafr.) ?

Deux mâles, deux femelles et un jeune de Machay recueillis en novembre et décembre. Iris brun foncé.

Ces oiseaux sont intermédiaires entre la vraie *C. victorini* et la *C. sumptuosa*, le dos est d'un olive plus obscur que dans la première et mélangé de noirâtre dans sa partie supérieure.

61. Dubusia tæniata (Boiss.).

Un mâle pris à San Rafael en février.

62. Tanagra cana, Sws.

Deux femelles de Yaguachi.

*63. Tanagra cœlestis, Spix.

Une femelle de Mapoto, prise le 5 janvier.

*64. Ramphocœlus jacapa (L.).

Deux mâles et une femelle de Machay et de Mapoto pris en novembre et en janvier.

*65. Pyranga rubra (L.).

Un jeune mâle de Machay, tué le 6 décembre. Iris brun grisâtre foncé.

66. Pyranga æstiva (Gm.).

Quatre mâles, deux femelles et deux jeunes mâles de Machay et de Mapoto, recueillis depuis novembre jusqu'en février. Iris brun grisâtre foncé.

*67. Pyranga rubriceps, Gr.

Deux mâles et un oiseau sans indication de sexe, recueillis à Baños en février. Iris brun foncé.

68. Pyranga ardens (Tsch.).

Un mâle pris à Mapoto le 17 janvier. Iris brun foncé.

69. Creurgops verticalis, Scl.

Deux paires recueillies à Machay en novembre et décembre. Iris brun rougeâtre.

*70. Chlorospingus oleagineus, Scl.

Un mâle et un oiseau sans indication de sexe recueillis à Machay en novembre et décembre. Iris brun foncé.

71. Chlorospingus superciliaris nigrifrons, Lawr.

Trois mâles et une femelle de San Rafael recueillis en février et en mars. Iris brun foncé.

*72. Chlorospingus atripileus (Lafr.).

Une paire de San Rafael, recueillie en mars. Iris brun foncé.

73. Chlorospingus flavigularis (Scl.).

Six mâles ad., deux femelles et un jeune mâle recueillis à Machay en novembre et décembre et à Mapoto en janvier.

Les deux mâles de Mapoto diffèrent de ceux de Machay par le jaune de la gorge d'un orangé intense séparé au milieu de gris, tandis que tous les autres ont la plaque gulaire d'un jaune soufré (Machay est situé à 1000 pieds au dessus de Mapoto). La couleur de la poitrine les distingue aussi ; ceux de Mapoto l'ont cendré pur, tandis que dans les oiseaux de Machay elle est grise. Il y a aussi une différence dans la taille ; les oiseaux de Mapoto ont l'aile longue de 74–76 mm., tandis que ceux de Machay l'ont de 79–84 mm. L'iris dans les oiseaux de Machay est gris cendré, celui des oiseaux de Mapoto brun noisette.

Tous ces oiseaux se distinguent des oiseaux de Chimbo (pente occidentale) par le jaune de la plaque gulaire uniforme sur toute la surface, tandis qu'il est plus ou moins interrompu au milieu par une nuance grisâtre dans les oiseaux occidentaux.

Le jeune oiseau de Mapoto se distingue des adultes par le jaune gulaire plus pâle et subondulé de gris.

74. Chlorospingus signatus, n. sp.

Ch. canigulari *affinis, sed crassitie majore, rostro breviore, stria lata et longa postoculari nivea supra oculum incipiente, tectricibus auricularibus nigricantibus, et gula abdomineque ad latera magis cinereo tinctis sane diversus.*

♂ et ♀ ad. D'un vert-olive jaunâtre en dessus et sur les ailes semblable à celui de l'espèce citée, mais un peu plus obscur ; le cendré de la tête un peu plus foncé avec une raie sourcilière postoculaire d'un blanc pur, assez large et souvent prolongé en avant jusqu'au milieu ou même jusqu'au bord antérieur de l'œil ; les tectrices auriculaires beaucoup plus foncés presque noirâtres bordent aussi le bord inférieur des yeux ; la gorge est plus ou moins enduite de cendré ; sur les côtés de l'abdomen la couleur cendrée est plus fortement développée entre le vert des flancs et le blanc du milieu. Le reste est comme chez l'oiseau cité. Bec noir corné à mandibule grise plus foncé à l'extrémité et à la base ; pattes grises ; iris brun rougeâtre.

Le bec de cet oiseau est beaucoup plus long que celui de l'oiseau avec lequel nous le comparons, ce qui lui donne une autre forme lorsqu'on le voit d'en haut.

♂. Longueur totale 160, vol 235, aile 73–78, queue 58–62, bec 15, tarse 20 mm.

♀. Longueur totale 150, vol 215, aile 64–65, queue 51–52, bec 15, tarse 19 mm.

Cinq mâles et six femelles de Machay et de Mapoto, recueillis depuis novembre jusqu'en janvier.

*75. Chlorospingus melanotis, Scl. ?

Un mâle paraissant être jeune pris en février à Baños. Iris brun foncé.

Cet oiseau se distingue du *Ch. melanotis* de Bogota (Musée Berlepsch) par la couleur olive presque uniforme sur tout le dessus du corps depuis le front jusqu'aux suscaudales, et par le manque complet d'une série de taches blanches formant une sorte de sourcil commençant des narines ; en dessous il a le roussâtre de la gorge et du cou antérieur un peu plus intense, la couleur des flancs plus foncée. Du *Ch. berlepschi* du Pérou central cet oiseau diffère également par la couleur du dessus, par le manque de noir au menton et sur les côtés de la gorge, par le roux de la plaque jugulaire beaucoup moins intense, et le milieu de l'abdomen non ocreux. De l'autre côté il ressemble à ce dernier par le manque complet du sourcil blanc et les lores noires en entier. Le bec est comme celui de l'oiseau de Bogota, tandis que dans l'oiseau péruvien il est beaucoup plus court et plus fin.

Longueur de l'aile 70, queue 65, bec 15 mm.

UROTHRAUPIS, gen. n.

Rostrum breve, compressum, culmine arcuato, tomiis maxillæ apice emarginatis; pedes robusti; alæ longiusculæ, remige 4a longissima, 3a et 5a æqualibus, quarta parum brevioribus; cauda longiuscula, rectricibus latis subacuminatis, apice rotundata.

76. UROTHRAUPIS STOLZMANNI, sp. n. (Plate VIII.)

Corpore supra, alis caudaque nigris; subtus schistaceo-grisea albo varia; gula latissima alba; hypochondriis schistaceis immaculatis; tectricibus alarum griseo marginatis; remigibus primariis margine tenuissimo albido; subalaribus schistaceis, campterio albido vario. Rostrum fusco-corneum; pedes fusco-brunnei; iris fusco-brunnea.

♂. Le noir terne occupe le sommet et les côtés de la tête, le cou postérieur, le dos jusqu'aux tectrices caudales, les ailes et la queue; la gorge est longuement et largement blanche subondulée de noir très finement et d'une manière peu distincte; la poitrine blanche tachetée irrégulièrement d'ardoisé; abdomen ardoisé varié de grosses taches blanches irrégulières sur le milieu, les flancs d'une couleur uniforme; souscaudales ardoisées bordées de blanchâtre; tibias de la couleur des flancs; les grandes et les moyennes tectrices alaires bordées largement de gris; des bordures blanchâtres très fines sur les quatre premières remiges primaires; sousalaires schistacées; pli de l'aile parsemé de petites taches blanchâtres. Bec gris corné foncé, plus clair et tirant au carné à la base; pattes d'un brun grisâtre obscur; iris brun foncé.

♀. Semblable au mâle et ne s'en distingue que par une nuance olivâtre sur les côtés du ventre, de la région anale, du croupion, et sur les bordures des tectrices alaires; les bordures des remiges primaires sont aussi d'un olive clair. Cette différence peut provenir d'une autre raison, car un des mâles présente aussi la même particularité mais en degrés moins forts.

Le jeune ne diffère des adultes que par des bordures brunâtres aux tectrices alaires, par une légère teinte brunâtre sur les flancs du ventre, moins de blanc sur l'abdomen, le bec plus pâle.

♂. Longueur totale 187, vol 253, aile 80, queue 80, bec 15·5, tarse 28 millim.

♀. Longueur totale 180, vol 253, aile 71, bec 17, tarse 26 millim.

La différence entre l'extrémité de la médiane 11 mm. chez le mâle, 15 chez la femelle.

Deux mâles, deux femelles et un jeune recueillis à San Rafael en mars.

*77. CARENOCHROUS SCHISTACEUS (Boiss.).

Trois mâles et deux femelles de San Rafael pris en mars. Iris brun rougeâtre.

*78. CARENOCHROUS PALLIDINUCHUS (Boiss.).

Trois mâles, deux femelles et deux jeunes de San Rafael et de Baños recueillis en février et mars. Iris brun rougeâtre.

*79. BUARREMON BRUNNEINUCHUS (Lafr.).

Deux mâles et une femelle de Machay et de Mapoto pris en novembre et janvier.

80. BUARREMON ASSIMILIS (Boiss.).

Deux femelles de San Rafael et de Baños recueillis en février.

81. SALTATOR MAGNUS (Gm.).

Un mâle de Yaguachi.

82. PSITTOSPIZA RIEFFERI (Boiss.).

Un mâle de Baños tué en février. Iris marron de la nuance semblable à celle des plumes environnantes.

FRINGILLIDÆ.

*83. PHEUCTICUS CRISSALIS, Scl. et Salv. P. Z. S. 1877, p. 19 (décrit de Riobamba et Sical).

Trois mâles, deux femelles et un jeune mâle de San Rafael, recueillis depuis février jusqu'en mai. Iris brun foncé.

*84. HEDYMELES LUDOVICIANA (L.).

Un mâle et une femelle recueillis à Mapoto en janvier. Iris brun foncé.

85. SPERMOPHILA OPHTHALMICA, Scl.

Un mâle ad. de Yaguachi recueilli en mai.

86. SPERMOPHILA LUCTUOSA, Lafr.

Deux mâles, huit femelles et jeunes de Mapoto et Machay recueillis en décembre et janvier.

*87. SPERMOPHILA OCELLATA, Scl. et Salv.

Une femelle de Machay, prise le 5 décembre.

88. VOLATINIA JACARINA SPLENDENS (Vieill.).

Deux mâles, une femelle et deux jeunes mâles recueillis à Yaguachi en août 1883 et en mai 1884. Iris brun foncé.

89. CORYPHOSPINGUS CRUENTUS (Less.).

Une paire de Yaguachi recueillie en août.

*90. SPODIORNIS JARDINEI, Scl. P. Z. S. 1866, p. 322.

Trois mâles recueillis à La Union en septembre. Iris brun foncé.

91. Phrygilus alaudinus (Kittl.).

Deux mâles de Chimborazo recueillis en avril.

*92. Phrygilus unicolor (Lafr. et d'Orb.).

Quatre mâles ad., deux femelles et quatre jeunes de San Rafael et de Chimborazo recueillis en mars et en avril. Iris brun foncé.

93. Catamenia analoides (Lafr.).

Un mâle pris entre Chimborazo et Riobamba le 21 avril, 1884. Iris brun foncé.

94. Catamenia inornata (Lafr.).

Catamenia homochroa, Berl. et Tacz. P. Z. S. 1884, p. 293.

Un mâle et deux femelles de San Rafael recueillis en mars. Ces oiseaux sont identiques à ceux de Cechce et du Pérou septentrional, et sont d'une taille moins forte que la *C. inornata* typique.

*95. Catamenia homochroa, Scl.

Deux jeunes mâles de San Rafael recueillis en mars, et appartenant à l'espèce du Pérou central, dont deux mâles adultes ont été fournis par M. Jelski au Musée de Varsovie. Cette espèce a beaucoup d'affinités au genre *Phrygilus*.

*96. Coturniculus peruanus, Bp.

Mâle ad. et un jeune de Machay et de Mapoto, recueillis en décembre et en janvier.

Le jeune en premier plumage diffère du péruvien dans le même âge par la couleur du ventre d'un jaune pâle au lieu de blanc, et par les taches foncées de la poitrine beaucoup plus grosses sur un fond beaucoup plus foncé.

97. Embernagra striaticeps, Lafr.

Un mâle de Yaguachi.

98. Sycalis luteola, Sparrm.

Mâle et deux femelles recueillis entre Riobamba et Chimborazo.

99. Chrysomitris capitalis, Cab.

Une paire de Mapoto recueillie en février.

Toutes les femelles péruviennes que j'ai vues avaient le dessous d'un jaune sérin plus ou moins fort, celle-ci a le dessous tout-à-fait semblable à la femelle du *Ch. spinescens* de Bogota; on voit cependant que notre femelle est jeune, probablement dans son deuxième plumage.

Icteridæ.

*100. Ostinops alfredi (Des Murs).

Une femelle prise à Mapoto le 17 janvier. Iris brun grisâtre foncé. Cet oiseau ne paraît pas être adulte, ayant le bec nébulé de brunâtre;

par le manque complet du jaune au front il ressemble aux oiseaux de Tambillo (Pérou septentrional), et n'en diffère que par la nuance un peu plus roussâtre.

101. Cassicus uropygialis, Lafr.

Un mâle et deux femelles de Machay et de Mapoto, recueillis en décembre et janvier. Iris bleu clair.

Ces oiseaux s'appliquent parfaitement à la diagnose de M. Sclater, et ressemblent en tout à l'oiseau d'Antioquia du Musée Berlepsch. Quant à l'oiseau de Chimbo, il est d'une taille moins forte; mais comme c'est une femelle unique, on ne peut pas dire rien de positif si cet oiseau présente une différence individuelle, ou si tous les oiseaux de la pente occidentale des Cordillères sont d'une taille plus petite, comme cela a lieu dans beaucoup d'espèces remplaçantes.

La ♀ de Machay a l'aile longue de 140, queue 112, bec 30 millim., tandis que la ♀ de Chimbo a l'aile de 120, queue 92, bec 26 millim.

Les dimensions prises par M. Stolzmann sur les oiseaux en chair sont, dans la femelle de Machay, longueur 286, vol 430 millim., tandis que dans la femelle de Chimbo ces dimensions sont représentées par 256 et 380 millim.

*102. Cassicus leucorhamphus (Bp.).

Deux femelles recueillies à San Rafael en mars. Iris bleu de ciel.

103. Cassicus flavicrissus, Scl.

Deux femelles de Yaguachi.

104. Cassicus prevosti (Less.).

Jeune mâle de Baños, pris en février. Iris blanc sale.

105. Sturnella bellicosa, De Filippi.

Quatre mâles recueillis en mai à Riobamba.

*106. Lampropsar warszewiczi, Cab.

Mâle, femelle et jeune de Yaguachi, recueillis en mai. Iris brun très foncé.

*107. Molothrus purpurascens, Cass.?

Jeune de Yaguachi.

Corvidæ.

108. Cyanocitta turcosa, Bp.

Une paire de San Rafael, prise en février et en mars.

*109. Cyanocorax incas (Bodd.).

Une femelle prise à Machay en novembre.

Tyrannidæ.

*110. Myiotheretes striaticollis (Scl.).

Deux mâles et une femelle de Machay et de San Rafael recueillis en novembre, décembre et mars. Iris brun foncé.

Les oiseaux péruviens se distinguent des oiseaux typiques par le bec moins élargi et par les stries noires plus prolongées sur la poitrine.

*111. Myiotheretes erythropygius (Scl.).

Trois mâles, une femelle et deux jeunes de San Rafael recueillis en mars. Iris brun foncé. Les jeunes en premier plumage ressemblent aux adultes et ne s'en distinguent que par le blanc sale au front et passant plutôt au cendré ; la nuque colorée de brun roussâtre ; la poitrine brunâtre pale, le blanc des bordures aux remiges secondaires teint d'ocreux.

112. Ochthodiæta fumigata (Boiss.).

Femelle et jeune de La Union (8800 pieds) et de San Rafael recueillis en octobre et en mars. Iris brun grisâtre chez l'adulte et brun foncé chez le jeune.

113. Ochthœca fumicolor, Scl.

Un mâle pris à San Rafael en mars. Iris brun foncé.

114. Ochthœca lessoni, Scl.

Trois mâles et deux femelles pris à Baños en février.

*115. Ochthœca rufimarginata, Lawr.

Une paire prise à San Rafael en mars. Iris brun foncé.

*116. Ochthœca cinnamomeiventris (Lafr.).

Deux paires recueillies à Machay et à San Rafael en novembre et en mars. Iris brun foncé.

Ces oiseaux ont le dessus du corps et la gorge d'une couleur plus claire et plus schistacée (au lieu de noirâtre) que dans un exemplaire d'Antioquia du Musée Berlepsch ; les ailes un peu plus longues, la queue plus courte.

117. Mecocerculus pœcilocercus (Scl. et Salv.).

Un mâle de Baños pris en février.

118. Sayornis cineracea (Lafr.).

Un mâle et deux femelles de San Rafael et de Mapoto pris en janvier et en mars. Iris brun foncé.

119. Fluvicola atripennis, Scl.

Un mâle de Yaguachi.

*120. Muscisaxicola alpina, Jard.

Quatre mâles de Chimborazo et de San Rafael, pris en mars et avril. Iris brun foncé.

Pseudotriccus, g. n.

Bec intermédiaire entre ceux de Myiobius et de Todirostrum, à cils basals forts et longs; narines rondes, ouvertes, placées dans un enfoncement latéral; tarse élevé à scutelles soudées parfaitement entre elles; ailes à 4e et 5e remiges les plus longues et égales, 6e à peine plus courte; queue médiocre à rectrices subétagées; plumage soyeux et moux.

*121. Pseudotriccus pelzelni, sp. n.

P. *supra olivaceus, plumis cervicis elongatis; subtus dilutior, abdomine medio pallide sulphureo; alis caudaque schistaceis, plumis olivaceo marginatis.*

♂ et ♀ ad. Parties supérieures du corps olives, les plumes cervicales longues et plates, assez larges et arrondies à l'extrémité, formant une huppe abondante que l'oiseau doit redresser à volonté, ces plumes paraissent être d'une nuance un peu différente dans certaines directions de la lumière tirant un peu à l'ardoisé; côtés de la tête concolores au dos; milieu de l'abdomen jaune soufré pâle, le reste du dessous d'un olive moins foncé que celui du dos; enduit de jaunâtre sur la gorge; la femelle a les côtés du bas ventre et les souscaudales roussâtres. Ailes et queue schistacées à plumes bordées d'olive, les bordures des remiges tirant un peu au roussâtre; sous-alaires olive jaunâtre. Bec noir corné avec une bande plus pâle en dessous de la mandibule; pattes d'un gris jaunâtre sale; iris brun rougeâtre chez le mâle, brun foncé chez la femelle.

Le jeune oiseau se distingue de l'adulte par la couleur du sommet de la tête plus obscure à plumes cervicales moins longues, une autre nuance de la poitrine et des flancs tirant un peu au roussâtre; les bordures des remiges olives; les pattes d'un jaune pâle; iris brun foncé.

♂ Longueur totale 133, vol 183, aile 58, queue 52, bec 15, tarse 21 mill.

♀ Longueur totale 120, vol 179, aile 51, queue 51, bec 15, tarse 21 mill.

Trois mâles, une femelle et un jeune recueillis à Machay et Mapoto en novembre, décembre et janvier.

Ce genre est difficile à placer dans le système d'une manière correcte, tant il présente des affinités aux différents groupes: par la forme du bec il parait avoir le plus de rapport avec les *Platyrhynchinæ*, par l'abondance et le développement des cils à la base du bec aux *Myiobius*, et par la hauteur du tarse, couvert d'une plaque presque soudée complètement il s'approche aux Piprides, auxquels selon M. Stolzmann il ressemble le plus par ses habitudes.

Nous dédions cette espèce à M. A. von Pelzeln à Vienne.

122. Platyrhynchus albigularis, Scl.

Un mâle pris à Machay en décembre. Iris brun foncé.

123. Todirostrum sclateri, Cab. et Hein.

Une femelle de Yaguachi prise en mai.

*124. Todirostrum cinereum (L.).

Une femelle prise en janvier à Mapoto. Iris blanc légèrement jaunâtre.

125. Pœcilotriccus ruficeps (Kaup), P. Z. S. 1851, p. 52 (décrit de "Mexico").

Une paire recueillie à Baños en février. Iris brun cerise.

Ces oiseaux ressemblent en tout à ceux de Bogota (Collection Sclater) et à l'oiseau de l'Antioquia (Musée Berlepsch): ils sont seulement un peu plus petits et ont le blanc de la gorge lavé d'isabelle; le bec un peu plus court.

♂ Longueur de l'aile 48, queue 39, bec 13, tarse 16 mill.

♀ Longueur de l'aile 45, queue 35, bec 14, tarse 16 mill.

126. Lophotriccus squamicristatus (Lafr.).

Six exemplaires de Machay et de Mapoto, pris en novembre, janvier et février.

*127. Anæretes agilis, Scl.

Deux femelles de San Rafael recueillies en mars. Iris brun foncé.

Ces oiseaux ont les ailes et la queue un peu plus longues que les oiseaux de Bogota, le noir du milieu du sommet de la tête et de la huppe plus intense et plus pur, la mandibule plus largement blanche à la base. Longueur de l'aile 58, queue 67, tandis que les oiseaux de Bogota ont l'aile longue de 52·5–56·5, la queue 61·5–65 mill.

*128. Leptopogon pœcilotis, Scl. P. Z. S. 1862, p. 111 (décrit de Bogota).

Trois mâles et quatre femelles de Machay, recueillis en décembre. Iris brun foncé.

129. Leptopogon superciliaris, Tsch.

Deux mâles recueillis à Machay et à Mapoto en novembre et en janvier. Iris brun foncé.

Ces oiseaux se distinguent des péruviens par le sommet de la tête beaucoup plus foncé, schistacé et non cendré, le bec plus large.

Longueur de l'aile 71, queue 64, bec 18, tarse 15 mill.

*130. Leptopogon erythrops, Scl. P. Z. S. 1862, p. 111 (décrit de Bogota).

Cinq mâles et quatre femelles de Machay et de Mapoto, recueillis en novembre, décembre et janvier. Iris brun foncé.

L'espèce n'était connue que des environs de Bogota et d'Antioquia.

*131. Pogonotriccus ophthalmicus, Tacz.

Quatre mâles de Mapoto et de Machay, recueillis en novembre, décembre et janvier. Iris brun foncé.

*132. Pogonotriccus gualaquizæ, Scl. MS. (sp. inedit).

Une femelle prise à Mapoto le 22 janvier. Iris brun foncé.

133. Capsiempis flaveola (Licht.).

Une femelle de Yaguachi.

*134. Tyranniscus cinereiceps (Scl.).

Un mâle et un oiseau sans indication de sexe de Machay et de Mapoto pris en décembre et janvier. Iris brun foncé.

L'oiseau de Chimbo placé dans la liste de 1883 sous ce nom est différent, c'est le *T. leucogenys*, Scl., déterminé par M. Sclater.

*135. Tyranniscus plumbeiceps, Lawr.

Pogonotriccus plumbeiceps, Lawr. Ann. Lyc. New York, ix. p. 267 (décrit de Bogota).

Deux mâles et deux oiseaux sans indication de sexe recueillis à Machay en novembre et décembre. Iris brun foncé.

136. Tyranniscus chrysops, Scl.

Une paire recueillie à Mapoto en janvier.

137. Mionectes striaticollis (Lafr. et d'Orb.).

Sept mâles et deux femelles recueillis à Mapoto, Machay et Baños en décembre et janvier. Iris brun foncé.

138. Ornithion sclateri, Berl. et Tacz.

Une femelle de Yaguachi.

139. Elainea griseigularis, Scl.

Dix exemplaires de Mapoto, de Palichtagua (7800 pieds) et de San Rafael recueillis en janvier et en février. Iris brun foncé.

Ces oiseaux sont un peu plus jaunâtres en dessous, à gorge plus pâle que l'oiseau de l'occident.

140. Elainea semipagana, Scl.

Une femelle de Yaguachi.

*141. Myiozetetes similis (Spix).

Un mâle de Mapoto pris le 8 janvier. Iris brun foncé.

*142. Rhynchocyclus fulvipectus, Scl. P. Z. S. 1860, p. 92.

Cinq mâles et deux femelles de Mapoto et de Machay recueillis en novembre, décembre, janvier et février. Iris gris foncé.

143. Rhynchocyclus peruvianus æquatorialis, Berl. et Tacz.

Quatre mâles et deux femelles de Mapoto et de Machay recueillis en novembre, décembre et janvier.

Ces oiseaux sont presque identiques à ceux de Huambo (Pérou sept.), ils ont le dos d'un olive plus foncé et le cendré de la tête plus obscur que les oiseaux de Chimbo ; la couleur jaune du dessous est presque la même dans tous ces oiseaux. La forme du bec est variable ; la femelle de Chimbo et la femelle de Lechugal l'ont le plus élargi, un des mâles de Mapoto l'a le plus atténué à l'extrémité, mais plus large que l'oiseau typique du Pérou central. Les uns ont la mandibule blanche jusqu'à l'extrémité, dans les autres l'extrémité est plus ou moins foncée. Tous présentent des différences assez grandes dans les dimensions. L'oiseau typique a l'olive du dos aussi foncé que les oiseaux de Mapoto et de Machay, ceux de Huambo l'ont un peu plus vert, les oiseaux de Chimbo et de Lechugal le plus clair.

*144. CONOPIAS CINCHONETI (Tsch.).

Une femelle prise à Machay en novembre. Iris brun foncé.

Semblable à l'oiseau de Bogota (Musée Berlepsch) mais un peu plus petite et sans bordures internes d'un jaune citron sur les plumes du milieu du sommet de la tête.

145. MYIODYNASTES CHRYSOCEPHALUS MINOR, nob.

Une paire de Machay et de Mapoto recueillie en novembre et en janvier. Iris brun foncé.

Taille moins forte que chez les oiseaux péruviens (dans la longueur de l'aile la différence est de 10 mill.) ; le bec plus large et moins fortement comprimé à l'extrémité. Dans la coloration il n'y a que la seule différence au sommet de la tête du mâle, dont les plumes latérales sont presque noires, tandis qu'elles sont d'un cendré schistacé chez le péruvien.

*146. MYIODYNASTES AUDAX (Gm.).

Un mâle de Yaguachi

147. MEGARHYNCHUS PITANGUA CHRYSOGASTER (Scl.).

Trois exemplaires de Yaguachi.

*148. MYIOBIUS VILLOSUS, Scl.

Un mâle et deux femelles de Machay et de Mapoto, recueillis en décembre et en janvier. Iris brun foncé.

*149. MYIOBIUS PHŒNICURUS (Scl.).

Cinq mâles recueillis à Mapoto en janvier et février. Iris brun foncé.

*150. MYIOBIUS CINNAMOMEUS (Lafr. et d'Orb.).

Huit exemplaires de Mapoto, Machay, Baños et San Rafael recueillis depuis novembre jusqu'en février.

*151. MYIOBIUS PHŒNICOMITRA, Stolzm. MS., sp. n.

M. *supra olivaceus, crista interna rubro-cinnamomea ; subtus pallide sulphureus, pectore hypochondriisque olivaceo indutis ; alis caudaque fusco-schistaceis, tectricibus alarum minoribus dorso concoloribus, mediis et majoribus e rufescente olivaceo late marginatis ; remigibus margine externo olivaceo, interno ochraceo ; subalaribus pallide sulphureis.*

♂ ad. Olive uniforme en dessus, à sommet de la tête concolore au dos, avec une large huppe interne cannelle rougeâtre ; côtés de la tête d'un olive moins foncé que le dos avec un cercle d'un jaune pâle fin autour de l'œil ; dessous du corps d'un jaune soufré pâle à poitrine et les flancs de l'abdomen d'un olive plus pâle que celui du dos ; les plumes jaunes de la gorge plus ou moins terminées d'olive. Ailes et queue d'un schistacé foncé à petites tectrices alaires de la couleur du dos, les grandes et les moyennes bordées largement d'olive pâle tirant un peu au roussâtre ; bordures externes des remiges olives très fines sur les primaires, bordures internes ocreuses ; sousalaires de la couleur analogue à celle du ventre ; bordures des rectrices olives. Bec noir à mandibule gris jaunâtre ; pattes grises ; iris brun foncé.

♀ Semblable au mâle, et n'en est distincte que par la huppe interne moins développée, qui dans les uns est de la couleur semblable à celle du mâle, dans les autres à peine indiquée par les bordures basales de quelques-unes des plumes du milieu de la tête colorées d'une faible nuance roussâtre.

♂ Longueur totale 130, vol 215, aile 67, queue 55, bec 16, tarse 17 mill.

♀ Longueur totale 133, vol 205, aile 63, queue 52, bec 15·5, tarse 17 mill.

Quatre mâles et cinq femelles recueillis à Mapoto en janvier et février.

152. Myiobius crypterythrus, Scl.

Un mâle de Yaguachi.

Les oiseaux de Callacate au Pérou septentrional diffèrent de ceux de Yaguachi et de Tumbez par une légère teinte jaunâtre sur l'abdomen, qui est blanc pur dans les oiseaux occidentaux.

*153. Myiobius cryptoxanthus, Scl. P. Z. S. 1860, p. 465 (décrit de Gualaquiza et Zamora).

Deux mâles et une femelle de Mapoto, recueillis en janvier. Iris brun foncé.

Cette forme est parfaitement distincte du *M. crypterythrus* par la huppe interne d'un jaune citron chez le mâle, par la couleur de l'abdomen jaune pâle au lieu de blanche, par les taches de la poitrine olivâtres et beaucoup plus larges de sorte que les bordures jaunes sont très peu développées ; la couleur du dessus plus olive et non brunâtre.

Longueur de l'aile 57, queue 53, bec 16, tarse 16 mill.

154. Contopus ardesiacus (Lafr.).

Deux mâles de Machay et de Mapoto recueillis en décembre et en janvier.

155. Contopus richardsoni, Sw.

Trois exemplaires de Machay et de Mapoto recueillis en décembre et janvier. Le bec de ces oiseaux est moins large et plus foncé en dessous que dans les oiseaux de Chimbo.

*156. Myiarchus cephalotes, Tacz.

Un mâle de Machay tué en décembre. Iris brun foncé.

157. Myiarchus phæocephalus, Scl.

Deux oiseaux de Yaguachi.

158. Tyrannus melancholicus, Vieil.

Une femelle tuée à Mapoto le 15 janvier. Iris brun foncé.

Pipridæ.

*159. Chloropipo flavicapilla (Scl.).

Une femelle de Mapoto, prise le 5 février. Iris brun foncé. Semblable en tout à la femelle de Bogota et n'en diffère que par le vert du dessus plus pur.

*160. Masius chrysopterus (Lafr.).

Un mâle de Mapoto du 5 février. Iris brun foncé. Un jeune mâle du 5 janvier. Identiques aux oiseaux de Bogota et non au *M. coronulatus* de l'occident.

Cotingidæ.

161. Pachyrhamphus spodiurus, Scl.

Un mâle pris en mai à Yaguachi.

162. Pachyrhamphus albogriseus, Scl.

Une femelle de Mapoto prise en janvier.

163. Pachyrhamphus versicolor (Hartl.).

Un jeune pris à Machay en décembre.

*164. Hadrostomus homochrous, Scl.

Sept oiseaux pris à Yaguachi en mai.

*165. Ampelio arcuatus (Lafr.).

Trois mâles et une femelle pris en mars à San Rafael. Iris gris blanchâtre chez le mâle, gris chez la femelle.

166. Heliochera rubrocristata (d'Orb. et Lafr.).

Une paire de San Rafael prise en mars.

*167. Rupicola peruviana (Lath.).

Onze exemplaires recueillis à Mapoto et à Machay en novembre, décembre et janvier. Iris du mâle est blanc jaunâtre avec une fine bordure jaune autour de la pupille ; chez la femelle il est blanc bleuâtre sale ; chez le jeune mâle prenant la livrée d'adulte l'iris est blanc jaunâtre sale à pupille entourée d'un cercle jaune très fin ; chez le jeune il est blanc bleuâtre.

L'orangé du plumage général de ces oiseaux est beaucoup plus intense que dans les oiseaux péruviens. Le mâle diffère aussi de ce dernier par les trois remiges tertiaires dont le cendré terminal occupe un espace beaucoup plus restreint, ne couvrant pas en entier le noir velouté basal de la remige suivante, ce qui fait que le cendré y est interrompu par trois bandes plus ou moins larges, tandis que dans les oiseaux péruviens toute la surface externe de ces trois remiges est d'un cendré parfaitement uniforme. Les oiseaux de Sarayacu et de la Nouvelle Grenade ressemblent à nos oiseaux de Mapoto et de Machay.

*168. Cephalopterus ornatus, Geoffr.

Une femelle prise à Mapoto le 10 janvier. Iris blanc sale.

Dendrocolaptidæ.

169. Furnarius cinnamomeus (Less.).

Deux mâles et une femelle de Yaguachi.

*170. Upucerthia excelsior (Scl.), P. Z. S. 1860, p. 77 (décrit de Chimborazo).

Trois mâles et deux femelles recueillis à San Rafael et au Chimborazo en mars et en avril. Iris brun foncé.

*171. Cinclodes albidiventris, Scl. P. Z. S. 1860, p. 77 (décrit de Chimborazo).

Trois mâles et deux oiseaux sans indication de sexe de Chimborazo et de San Rafael recueillis en mars et en avril. Iris brun foncé.

*172. Lochmias obscurata, Cab.; Tacz. Ornith. du Pérou, ii. p. 113.

Un mâle pris à Machay le 13 décembre. Iris brun très foncé.

Ce mâle est d'une taille plus forte que la femelle typique et s'en distingue par les taches blanches plus grosses sur le milieu du ventre; les flancs sont également largement immaculés; les côtés du cou sont d'une nuance roux-olivâtre plus claire qu'ailleurs; les plumes de la région jugulaire bordées largement de noir.

Longueur totale 172, vol 253, aile 73, queue 77, bec 26·5, tarse 17 mm.

*173. Leptasthenura andicola, Scl. P. Z. S. 1866, p. 636, tab. xlix. f. 2 (décrit de Chimborazo).

Trois mâles et une femelle recueillis au Chimborazo en février. Iris brun foncé. Les oiseaux du Pérou central ont l'aile plus longue de quelques millimètres.

174. Synallaxis pudica, Scl.

Une femelle de Yaguachi prise le 20 août. Iris brun châtain.

175. Synallaxis frontalis, Pelz.

Deux femelles de Machay et de Baños prises en décembre et en février. Iris brun noisette.

*176. Synallaxis fuliginosa, Lafr. ?

Un jeune mâle de San Rafael, pris en mars. Iris brun foncé.

Cet oiseau appartient à ce groupe à queue rigide, les barbes désunies, mais il ne présente rien de positif pour qu'on puisse reconnaître l'espèce pour sur. Le manque de roux au menton et le gris des sourcils indiqueraient qu'il appartient à la forme de la Colombie, mais les plumules blanches se trouvant déjà en grande partie autour de l'œil et la faiblesse du bec le rapprochent de la forme péruvienne *S. palpebralis* (Cab.). Mais on peut aussi supposer que c'est une forme intermédiaire. Cet oiseau est beaucoup moins roux en dessus que les deux espèces citées, à couleur grise du dessous moins pur, lavé légèrement de fauve sur le milieu du corps ; menton blanchâtre; queue d'un roux semblable à celui des deux formes ; barbes des rectrices semblables à celles du *S. fuliginosa*, et moins désunies que celles du *S. palpebralis*. Bec noir corné à mandibule un peu plus claire à la base ; pattes grises.

Longueur totale 198, vol 190, aile 56, queue 102, bec 17·5 mm.

*177. Synallaxis curtata, Scl. P. Z. S. 1869, p. 636, tab. xlix. f. 2 (décrit de Bogota).

Quatre mâles et un oiseau sans indication de sexe de Machay et de Mapoto, pris en novembre, janvier et février. Iris brun grisâtre.

Sur ces cinq oiseaux il y a un à sommet de la tête tout roux depuis la naissance du bec comme dans la figure de M. Sclater, un autre l'a aussi roux mais à couleur olive fort développée sur le derrière du front ; dans deux autres les plumes frontales sont plus ou moins bordées de roux ; il n'y a donc un dont le front n'a rien de roux. Il y a donc dans cette série toutes les transitions possibles.

*178. Synallaxis flammulata, Jard.

Six mâles, deux femelles et un oiseau sans indication de sexe, recueillis à Chimborazo et à San Rafael en mars et en avril. Iris brun foncé. Les oiseaux du Pérou central s'en distinguent par la coloration en général plus claire, l'ocreux de la gorge plus longuement et plus largement disposé et distinctement plus pâle ; les stries foncées du dessous moins grosses, ce qui produit que les blanches sont moins isolées ; le milieu de l'abdomen plus largement d'un blanc plus pur ; les rectrices sont rousses en dessous, moins variées de foncé ; la coloration du dos a moins de noir et les stries plus fines.

*179. Synallaxis striaticollis, Lafr.

Deux femelles et un jeune de Mapoto, recueillis en décembre, janvier et février. Iris terre de sienne.

Le jeune oiseau diffère des adultes par le sommet de la tête presque de la même couleur que le dos, avec quelques stries fauves sur le devant du front ; par le fond du dessous lavé de jaunâtre, à stries de la poitrine plus grosses et plus ocreuses, moins nettement dessinées ; ils n'ont rien de roux sur la gorge et le bas des joues ; pli de l'aile ocreux comme les sousalaires. Iris gris.

*180. Synallaxis singularis, sp. nov. (Plate VII. fig. 2.)

S. *corpore supra, alis caudaque fusco-cinereis, fronte clare rufa, striga superciliari albida; subtus flavida fusco striata; subcaudalibus griseis flavido late marginatis; subalaribus margineque interno remigum albido-flavis.*

♂ ad. Tout le dessus du corps d'un cendré ardoisé avec une nuance olivâtre très légère, front couvert de plumes d'un roux clair jusqu'au niveau du bord postérieur de l'œil formant sur le devant une couleur uniforme, puis des stries de plus en plus fines bordées de la couleur du fond général: tout le dessous du corps est d'un jaunâtre pâle, strié de noirâtre finement au cou, de stries de plus en plus grosses et graduellement moins foncées sur le reste en s'approchant de la queue; souscaudales grises bordées largement de roussâtre pâle; une strie blanc-jaunâtre occupe les lores et les sourcils prolongés jusqu'à la nuque; côtés de la tête de la couleur de la gorge avec une raie foncée en arrière de l'œil. Ailes de la couleur du dos, mais sans nuance olive, à remiges primaires bordées finement d'olive claire; les remiges tertiaires, les secondaires et les grandes tectrices bordées finement de blanchâtre à l'extrémité; sousalaires d'un blanc jaunâtre; de l'aile plus jaunâtre; bord interne des remiges blanchâtre. Queue d'un cendré schistacé. Mâchoire gris corné foncé, mandibule carnée à extrémité foncée; pattes gris olives; iris brun rougeâtre.

Longueur totale 131, vol 188, aile 60, queue 50, bec 16, tarse 16, distance entre l'extrémité de la rectrice externe et de la médiane 13 mm.

Queue médiocre à 12 rectrices, larges, peu étagées, peu atténuées au bout qui est arrondi, et terminé en angle obtus dans les médianes.

Un mâle adulte de Mapoto, pris le 23 janvier.

181. Pseudocolaptes boissonneauti (Lafr.).

Deux paires recueillies en mars à San Rafael. Iris brun foncé.

*182. Automolus striaticeps, Scl. et Salv.

Deux mâles et deux femelles de Machay et de Mapoto recueillis en novembre, décembre et janvier. Iris brun foncé.

Identiques aux oiseaux de Bogota.

*183. Anabazenops mentalis, Stolzm. MS., sp. n.

A. *supra fusco-brunneus, pileo et collo postico nigris; uropgio tectricibusque caudæ superioribus obscure rufis; capite et dorso flavo striatis; subtus olivaceo-brunneus flavo striatus, gula stramineo-flava; alis dorso concoloribus immaculatis, subalaribus margineque interno remigum vivide ochraceis; cauda rubido rufa.*

♂ et ♀. Sommet de la tête et cou postérieur noirs, dos brun foncé, partie postérieure du croupion et les tectrices supérieures de la queue d'un roux ferrugineux foncé, des stries fines d'un jaune straminé sur tout le sommet de la tête, au dos et les scapulaires: les côtés de la tête couverts de plumes jaunes bordées de noir; en dessous la gorge est d'un beau straminé à éclat soyeux, le reste du dessous est d'un olive brunâtre beaucoup plus clair que le dos strié de straminé, ces stries sont peu larges non atténuées mais souvent élargies à l'extrémité ; souscaudales lavées de roussâtre avec une ligne médiane claire. Ailes de la couleur du dos non maculées, à barbe interne des remiges d'un brun obscur ; sousalaires et bord interne des remiges d'un roux ocreux vif. Queue d'un roux rougeâtre. Bec corné noirâtre à mandibule gris plombé foncé sur les côtés et à l'extrémité, grise pâle en dessous ; pattes grises ; iris brun foncé.

La femelle ne se distingue du mâle que par les stries du corps plus larges, surtout celles du dessous.

Le jeune en premier plumage diffère des adultes par les stries du dessus plus larges et d'un roux ferrugineux, et une large bande sourcilière de la même couleur ; en dessous il est d'un roux ferrugineux uniforme au cou, le milieu de la poitrine et du haut de l'abdomen, plus pâle et jaunâtre sur la gorge à plumes bordées finement de noirâtre, toutes ces plumes ainsi que celles de la poitrine ont la baguette blanchâtre se dessinant nettement sur le fond roux ; le reste de l'abdomen est d'un olive brunâtre semblable à celui des adultes varié de stries jaunâtres et rousses en partie moins régulières que celles des adultes ; sur les côtés de la tête il n'y a que les tectrices auriculaires qui sont comme dans l'adulte. Les ailes et la queue comme celles des adultes, mais avec une bordure roussâtre à l'extrémité des grandes tectrices secondaires, et une fine strie jaunâtre sur le milieu des autres. En changeant le plumage ils prennent les couleurs des adultes.

♂.	Longueur de l'aile	76,	queue	81,	bec	22,	tarse	20	mm.
♀.	„	75	„	80	„	23	„	20	„

♀. Longueur totale 202, vol 277 mm.

Trois mâles, une femelle et trois jeunes recueillis à Machay en novembre et décembre.

*184. Philydor striaticollis, Scl.

Deux mâles et six femelles recueillis à Mapoto et à Machay en novembre et en janvier. Iris brun foncé.

Ces oiseaux ressemblent en tout à ceux du Pérou central, mais ils ont la couleur du dessous plus olive, et celle du dos plus olive et moins roussâtre ; l'oiseau de Bogota (Coll. Berlepsch) est en dessous encore plus roussâtre que les oiseaux péruviens, à gorge d'un ocreux plus intense, le dos est comme dans les péruviens, la queue est d'un roux plus vif et plus clair que celle des péruviens et équatoriens. La forme du bec est tout à fait semblable dans les oiseaux des deux dernières localités, l'oiseau de Bogota l'a un peu différent en ce que l'arête est plus longuement droite, et plus brusquement arquée à l'extrémité ; ce dernier oiseau a l'aile un peu plus longue.

185. Xenops rutilus, Licht.

Deux mâles et une femelle de Machay pris en novembre et décembre. Ces oiseaux paraissent appartenir à la forme décrite par MM. Cabanis et Heine sous le nom de *X. heterurus*, ayant le noir de la queue plus répandu qu'ordinairement.

186. Margarornis perlata (Less.).

Un mâle tué à Baños en février.

187. Margarornis brunnescens, Scl.

Cinq mâles et trois femelles pris à Machay et Mapoto en novembre, décembre et janvier.

188. Glyphorhynchus cuneatus castelnaudi (Des Murs).

Un mâle et deux femelles de Mapoto pris en janvier. Iris brun foncé.

189. Sittasomus amazonus, Lafr.

Un exemplaire de Mapoto pris en janvier.

*190. Dendrornis triangularis (Lafr.).

Quatre mâles et quatre femelles de Machay, pris en novembre, décembre et janvier. Iris brun foncé.

Ces oiseaux ressemblent en tout aux oiseaux de la Nouvelle Grenade (Musée Berlepsch) et ne s'en distinguent que par l'olive du dessous moins obscure et les bordures noires des plumes du cou antérieur descendant plus bas vers la poitrine.

*191. Picolaptes lacrymiger (Des Murs).

Un oiseau sans indication de sexe pris à San Rafael le 4 mars. Iris brun foncé.

Cet oiseau a les stries du dessous également élargies et arrondies au bout comme dans les oiseaux typiques. Il se distingue des oiseaux de Medellin et d'Antioquia par le fond du dos beaucoup plus olive et moins roux avec beaucoup de stries fauves fines manquant entièrement chez les oiseaux cités. Dans la forme péruvienne *P. warszewiczi*, Cab., ces stries sont plus fines et beaucoup moins prononcées.

192. Picolaptes souleyeti (Des Murs).

Trois exemplaires recueillis à Yaguachi en mai.

*193. Xiphocolaptes compressirostris, Tacz.

Une femelle de San Rafael prise le 1 mars.

Oiseau intermédiaire entre les péruviens et le *X. promeropirhynchus* (Less.) de la Nouvelle Grenade, mais plus voisin du premier sous beaucoup de rapports. Il a les deux raies brunâtres bien prononcées le long de la gorge, le milieu de l'abdomen également fort tacheté sur toute son étendue jusqu'à la poitrine, où il y a aussi quelques taches noires sur le milieu même. Le bec est intermédiaire, presque aussi élevé comme dans les oiseaux péruviens mais pas aussi comprimé, il paraît être même plus large que dans les six oiseaux de la Nouvelle

Grenade (Musée de Varsovie et Musée Berlepsch) avec lesquels il a été comparé. La couleur du bec est aussi intermédiaire, plus foncée que celle du bec de l'oiseau péruvien mais non noire comme chez le *P. promeropirhynchus*.

194. XIPHORHYNCHUS THORACICUS, Scl.

Un oiseau de Yaguachi.

FORMICARIIDÆ.

*195. THAMNOPHILUS TENUIPUNCTATUS, Lafr. Rev. et. Mag. Zool. 1853, p. 339 (?).

Un mâle ad. de Mapoto, recueilli le 15 janvier. Iris gris très foncé.

Cet oiseau s'applique bien à la diagnose de Lafresnaye, il y a cependant dans cette description quelques détails qui ne s'accordent pas, comme "*remigibus atris vexillo interno tantummodo maculis triangularibus latioribus albis marginato,*" et "*rectricibus totis nigris acutissime limbo externo albo punctatis.*" On doit donc supposer que les barbes externes des remiges et les internes des rectrices sont sans maculature blanche, ce que n'est pas le cas chez l'oiseau de Mapoto. Il se distingue de l'espèce péruvienne que Taczanowski vient de décrire sous le nom de *Th. berlepschi* (Ornithologie du Pérou, tome ii. p. 22) par toutes les taches du dos et des ailes petites et isolées, tandis que chez l'oiseau cité elles forment des lignes transversales onduleuses et continues; les lignes caudales très largement interrompues sur le milieu des rectrices ; le bec beaucoup plus long. Le sommet de la tête et le dessous du corps est semblable dans ces deux formes.

Du *Th. tenuifasciatus*, Lawr., du Pérou septentrional notre oiseau diffère par le sommet de la tête non maculé, les taches au lieu de raies sur le dos, par les lignes caudales plus largement interrompues et le bec plus long.

*196. DYSITHAMNUS SUBPLUMBEUS, Scl. et Salv. P. Z. S. 1880, p. 158 (décrit de Sarayacu, Ecuador or.).

Un mâle, deux femelles et un jeune de Mapoto, recueillis en janvier. Iris gris foncé.

*197. DYSITHAMNUS LEUCOSTICTUS, Scl. P. Z. S. 1858, p. 66 et 223 (descr. fœm.[1]).

Trois mâles et deux femelles de Machay recueillis en décembre et en janvier.

♂ ad. D'un schistacé très foncé unicolore en dessus et sur la tête, d'un schistacé plus clair en dessous, à gorge longuement noirâtre ; les baguettes des plumes de la poitrine et de l'abdomen blanches en y formant des stries fines et très longues nettement dessinées sur le fond foncé ; région anale et les souscaudales tirant au grisâtre, ces dernières à baguettes blanchâtres. Tectrices alaires noires terminées chacune par une petite macule blanche ; les plumes de l'aile bâtarde

[1] Mr. Sclater n'avait connu que la femelle de cette espèce, qui paraît encore très rare dans les collections.

bordées à l'extérieur par une ligne blanche fine ; une grosse tache humérale blanche ; remiges noirâtres bordées à l'extérieur de cendré ; sousalaires d'un schistacé obscur, les grandes variées de blanc. Queue d'un schistacé foncé.

Le jeune mâle prenant sa livrée d'adulte a le schistacé du dessus moins foncé que chez l'adulte ; gorge d'un noirâtre moins intense, parsemé de petites stries blanches au menton ; des pareilles stries sur les côtés de la tête et au dessus de l'œil ; la poitrine et l'abdomen sont d'un cendré un peu plus foncé que celui de la femelle à stries blanches beaucoup moins grosses que celles de cette dernière ; milieu du bas ventre gris blanchâtre ; la grosse tache humérale blanche aussi développée comme chez le mâle adulte ; sur les nouvelles tectrices alaires les taches blanches plus petites et moins pures. Toutes les plumes de la robe précédente semblables à celles de la femelle, mais plus obscures et moins roussâtres.

♂. Longueur totale 152, vol 243, aile 75, queue 50, bec 21, tarse 22 mm.

♀. Longueur totale 176, vol 217, aile 66, queue 45, bec 21, tarse 20 mm.

*198. Cercomacra nigricans (Scl.).

Un mâle tué à Yaguachi en août. Iris brun foncé.

*199. Cercomacra approximans, Pelz. Orn. Bras. pp. 85 et 158 (?).

Quatre mâles, quatre femelles et un jeune mâle de Mapoto et de Machay, recueillis depuis novembre jusqu'en janvier. Iris brun foncé.

Ils s'accordent avec la description de M. Pelzeln, mais ce que dit cet auteur que le bec de cet oiseau est plus court que celui de la *C. tyrannina* ne s'applique pas aux oiseaux de M. Stolzmann, qui l'ont presque plus long que chez l'oiseau cité. Ils ne diffèrent du dernier que par les ailes plus longues, le cendré du dessus, surtout de la tête, plus clair, les bordures des susalaires plus larges, et les plumes de la poitrine bordées de blanc. La femelle présente des differences plus considérables.

*200. Herpsilochmus axillaris æquatorialis, nob.

H. axillari *simillimus, sed differt pileo maris medio albo punctato, lateribus late immaculatis.*

Le mâle de cet oiseau équatorien ressemble en tout au *H. axillaris* (Tsch.[1]) du Pérou septentrional et ne s'en distingue que par les macules blanches du sommet de la tête plus petites et disposées le long du milieu de cette partie, tandis que les côtés sont largement d'un noir immaculé ; le bec un peu plus long. Iris brun foncé.

La femelle ne présente aucune différence de la péruvienne.

[1] Taczanowski ayant examiné le type du *Thamnophilus axillaris*, Tschudi (Fauna Peruan. Orn. p. 174), a constaté l'identité avec son *Herpsilochmus puncticeps* décrit dans les P. Z. S. 1882, p. 30.

♂. Longueur totale 132, vol 174, aile 54, queue 46, bec 15, tarse 16 mm.

♀. Longueur totale 170, vol 177, aile 51, queue 48, bec 16, tarse 16 mm.

Une paire de Machay et de Mapoto recueillie en novembre et en janvier.

201. Myrmotherula menetriesi (d'Orb. et Lafr.).

Un mâle et trois femelles recueillis à Machay et à Mapoto en novembre et en janvier.

Ce mâle a les mêmes dimensions que celui de Chimbo, mais il en diffère par le noir de la gorge plus restreint et moins répandu sur la poitrine ; le cendré du dessus est plus clair.

*202. Formicarius thoracicus, Stolzm. MS., sp. n.

F. *supra fusco-olivaceo-brunneus ; capite toto cum gula nigris, pectore obscure rufo, abdomine ex olivaceo brunneo, subcaudalibus rufis ; alis nigricantibus, tectricibus superioribus pogonioque externo remigum dorso concoloribus, tectricibus alarum inferioribus ochraceo et nigro variis ; cauda nigricante.*

♂ ad. Le noir occupe toute la tête avec la gorge ; le dos est d'un brun olive très foncé à croupion et les tectrices supérieures de la queue colorés légèrement de roux ; cou antérieur et poitrine d'un roux rougeâtre très obscur ; abdomen d'un olive fuligineux beaucoup moins foncé que le dos ; souscaudales d'un roux foncé. Ailes noirâtres à tectrices supérieures et la barbe externe des remiges concolores au dos ; tectrices inférieures des ailes d'un ocreux vif avec deux larges bandes transversales noires ; barbe interne des remiges roussâtre à la base. Queue noirâtre. Bec noir corné ; pattes gris brunâtre foncé ; iris brun foncé.

♀. Semblable en tout au mâle et n'en distincte que par le roux de la poitrine moins obscur, prolongé le long du milieu de l'abdomen en une large bande d'un ocreux roussâtre jusqu'aux souscaudales.

♂. Longueur de l'aile 89, queue 59, bec 27, tarse 39 mm.

♀. Longueur totale 218, vol 310, aile 89, queue 60, bec 27, tarse 38 mm.

Une paire recueillie à Machay en décembre.

203. Grallaria ruficapilla, Lafr.

Une paire recueillie à San Rafael en mars.

*204. Grallaria hypoleuca, Scl.

Deux mâles et trois femelles recueillis à Machay et Mapoto en novembre, décembre et janvier. Iris brun très foncé.

205. Grallaria rufula, Lafr.

Un mâle et deux femelles recueillis à San Rafael en mars.

PTEROPTOCHIDÆ.

*206. SCYTALOPUS MAGELLANICUS (Lath.).

Une paire de Baños et de San Rafael pris en février et mars. Iris brun foncé.

Le mâle ressemble en tout à celui de Cutervo, il est seulement d'un noir un peu plus intense ; les dimensions sont les mêmes.

*207. SCYTALOPUS MICROPTERUS (Scl.), P. Z. S. 1858, p. 69 (décrit de Rio Napo).

Quatre oiseaux de Machay et de Mapoto, recueillis en novembre, décembre et janvier. Iris brun foncé.

La description de M. Sclater s'applique mieux à nos oiseaux que celle de Lafresnaye, ce dernier ne disant rien que le roux du croupion, du bas ventre et des souscaudales est rayé de noirâtre ; nous préférons donc de placer nos oiseaux sous le nom de M. Sclater, tant plus qu'ils viennent d'une localité voisine.

TROCHILIDÆ.

*208. EUTOXERES AQUILA HETERURUS, Gould.

Une femelle adulte et un jeune de Machay tués le 27 décembre. Ces oiseaux ont le bec plus fortement courbé que dans les *E. aquila* de la Colombie.

Le jeune en premier plumage à queue incomplètement développée a la gorge, le devant et les côtés du cou noirs, variés de stries fauves fines, élargies un peu à l'extrémité ; toutes les plumes du sommet de la tête et du dessus du corps frangées à l'extrémité de fauve roussâtre, les tectrices caudales entourées largement de cette dernière couleur ; toutes les remiges terminées par un point blanc.

209. PHAËTHORNIS SYRMATOPHORUS, Gould.

Quatre mâles et deux femelles de Machay et de Mapoto, recueillis en novembre, décembre et janvier.

*210. OREOTROCHILUS CHIMBORAZO (Bourc.).

Nombreux exemplaires des deux sexes et des jeunes pris sur le Chimborazo en avril.

*211. HEMISTEPHANIA RECTIROSTRIS, Gould.

Deux mâles et une femelle pris à Mapoto en janvier.

212. PANOPLITES MATHEWSI (Bourc.).

Cinq oiseaux de Baños recueillis en février.

213. CHÆTOCERCUS BOMBUS, Gould.

Une femelle de Yaguachi.

214. STEGANURA SOLSTITIALIS, Gould.

Un mâle et deux femelles pris en janvier à Mapoto.

Les mâles péruviens se distinguent de celui de l'Ecuadeur par les rectrices externes un peu plus longues, à partie dénuée plus droite, de sorte que les palettes s'appliquent parfaitement entre elles lorsque la queue est pliée, tandis que chez l'oiseau typique de l'Ecuadeur elles se croisent dans cette position ; la partie de cette rectrice dépassant la subexterne est beaucoup plus fine chez l'oiseau péruvien, la palette moins large. La rectrice subexterne est beaucoup plus longue chez l'oiseau péruvien, moins large, plus aigue et moins brillante sur la barbe externe. En outre on ne voit pas aucune différence.

215. Lesbia amaryllis (Bourc. et Muls.).

Trois mâles de Penipe entre Riobamba et Chimborazo pris en mars et avril.

*216. Cynanthus mocoa (Del. et Bourc.).

Cinq mâles et une femelle de Baños et de Mapoto pris en janvier et février.

Les mâles de l'Ecuadeur diffèrent des péruviens par les rectrices distinctement moins larges et moins atténuées à l'extrémité ; par le vert de ces rectrices passant plus au bleu dans certaines directions de la lumière : par le noir velouté de la partie basale des rectrices beaucoup moins enduit de bleu en général et ne distinct que près de la jonction des deux couleurs, de sorte que le noir presque pur est visible à l'extérieur dans la queue pliée tandis que chez l'oiseau péruvien c'est le bleu qui le remplace. La couleur du dessous du corps est plus cuivreuse chez l'oiseau péruvien. La plaque frontale brillante paraît être plus large chez l'oiseau péruvien, tandis que le bronzé environnant est plus clair, ne passant pas en noir propre à l'oiseau de l'Ecuadeur. La prase gulaire est aussi plus large chez l'oiseau péruvien et d'un bleu plus clair.

*217. Pterophanes temmincki (Boiss.).

Cinq exemplaires de San Rafael recueillis en mars.

*218. Metallura primolina, Bourc. Rev. et Mag. Zool. 1853, p. 295. (Laguano, Rio Napo coll. Osculati.)

Quatre mâles et deux femelles de San Rafael, recueillis en mars.

Dans les femelles les plumes verts dorées du cou antérieur et sur la gorge sont squamuleuses sur un fond fauve roussâtre, c'est à dire elles renferment une grosse tache verte entourée de la base fauve et d'une pareille bordure, ces taches vertes sont très petites et isolées sur la gorge ; les plumes de l'abdomen d'un vert bronzé lisse ont la base blanchâtre et une bordure fauve grisâtre, qui est prédominant sur le milieu du ventre ; tout le dos est d'un vert bronzé tirant plus ou moins au cuivreux presque uniforme depuis le front jusqu'aux dernières souscaudales. La queue est d'un vert bronzé antique, passant dans une certaine direction au bleu violâtre, à rectrices bordées finement de blanchâtre à l'extrémité ; l'externe terminée largement de gris, la suivante a une tache terminale de cette dernière couleur ; la page inférieure de la queue est d'un vert bronzé plus clair et plus brillant que la supérieure ; toutes les rectrices bordées dans toute leur longueur d'une ligne brun foncé. Les souscaudales sont d'un vert bronzé obscur bordées largement de roussâtre.

Tous les mâles ne paraissent pas être en plumage parfait. Un d'eux qui paraît être le plus adulte a le milieu du cou antérieur occupé par une tache oblongue paraissant être plus foncée que le plumage environnant, composée de gouttes d'un vert foncé tirant au noir dans les autres directions de la lumière, d'un vert étincellant dans les autres avec un éclat rouge cuivreux sur quelques-unes ; ces taches sont bordées de roussâtre. Toute la surface des parties inférieures du corps est d'un vert bronzé uniforme, à bordures des plumes grises très peu distinctes sur le milieu du ventre ; sous-caudales à bordures roussâtres plus foncées et moins prononcées que celles de la femelle. Queue comme celle de la femelle mais sans bordures à l'extrémité des rectrices.

Les autres mâles paraissant être moins adultes n'ont la tache jugulaire que représentée par quelques plumes noirâtres qui ont à la base de cette couleur une ligne d'un doré cuivreux très brillant. La gorge est couverte de gros points vert-bronzé sur un fond gris. Les plumes du ventre sont plus distinctement frangées de gris.

Un autre mâle probablement le plus jeune de tous a toute la gorge couverte de plumes squamiformes vertes, d'une nuance beaucoup plus vive et différente de cette du dessous ; toutes les plumes de l'abdomen et du ventre sont plus largement frangées de gris roussâtre que dans les autres ce qui indique que l'âge de l'oiseau est moins avancé.

Tous les exemplaires ont la région anale duveteuse blanche.

♂. Longueur de l'aile 60, queue 40, bec depuis la commissure 17·5, depuis les plumes frontales 13 mill.

♀. Longueur de l'aile 57, queue 37, bec depuis la commissure 16, depuis les plumes frontales 13 mill.

*219. Metallura tyrianthina quitensis (Gould).

Vingt exemplaires de San Rafael et de Baños, recueillis en février et mars.

220. Adelomyia melanogenys maculata (Gould).

Quatre oiseaux de Mapoto et de Machay pris en décembre et en janvier.

*221. Schistes geoffroyi (Bourc. et Muls.).

Mâle adulte de Machay pris en décembre.

L'oiseau péruvien se distingue de celui de l'Ecuadeur par le cuivreux du dos plus rouge ; la nuque plus cuivreuse ; le vert dessous non bleuâtre mais bronzé ; la queue plus étagée, la différence entre l'extrémité des rectrices médianes et des externes étant de 9 mill. tandis qu'elle n'est que de 5 chez l'oiseau de l'Ecuadeur.

222. Petasophora anais (Less.).

Une paire prise en avril à Chimborazo et à Baños.

223. Docimastes ensiferus schliephackei (Heine).
Une paire de San Rafael recueillie en mars.

*224. Helianthea lutetiæ (Del. et Bourc.).
Un mâle de Puela.

225. Heliotrypha viola (Gould).
Quatre exemplaires pris à La Union et Yoyacsi (9109 pieds) en septembre et novembre.

*226. Heliotrypha parzudakii (Longuem.).
Neuf exemplaires pris à Baños en février. Aucun des mâles n'a pas la queue aussi profondement fourchue que le mâle de la Nouvelle Grenade du Musée de Varsovie.

*227. Bourcieria torquata (Boiss.).
Un mâle et deux femelles de Baños, pris en février.

*228. Lampropygia columbiana, Elliot.
Quatre exemplaires de Machay et de Mapoto pris en novembre et janvier. Identiques aux oiseaux typiques de la Nouvelle Grenade.

229. Heliomaster albicrissa, Gould.
Un mâle de Yaguachi.

230. Eriocnemis luciani (Bourc.).
Nombreux exemplaires recueillis à San Rafael en février et mars.

*231. Eriocnemis mosquera (Bourc. et Muls.).
Un oiseau pris à San Rafael en mars. Oiseau non adulte à queue plus courte, moins fourchue ; les rectrices externes d'un acier noirâtre au lieu de verdâtre, les médianes d'un vert plus bleuâtre. Les suscaudales d'un vert d'or au lieu d'or cuivreux ; l'éclat cuivreux de la gorge et de la poitrine beaucoup moins fort et moins répandu ; dos d'un vert plus obscur.

*232. Eriocnemis smaragdinipectus, Gould.
Nombreux exemplaires des deux sexes recueillis à San Rafael en février et en mars.

233. Amazilia dumerilli (Less.).
Un mâle de Yaguachi.

Cypselidæ.

*234. Chætura brunneitorques, Lafr.
Trois mâles de Mapoto recueillis en février. Iris presque noir.

Caprimulgidæ.

*235. Stenopsis ruficervix, Scl.
Un mâle de Mapoto pris le 15 janvier. Iris presque noir.

STEATORNITHIDÆ.

*236. STEATORNIS CARIPENSIS PERUVIANUS, Tacz.

Trois femelles de Mayorazgo.

PICIDÆ.

*237. PICUMNUS LAFRESNAYI, J. Verr.; Malh. Monogr. Pic. ii. p. 282, tab. cxviii. f. 4 et 5.

Un mâle et deux jeunes femelles de Mapoto recueillis en octobre et en janvier.

L'espèce est décrite aussi de l'Ecuadeur; notre mâle s'accorde parfaitement avec la figure citée, la description de Malherbe est réduite à une diagnose très courte et insuffisante pour une détermination précise. Ces oiseaux diffèrent du *P. buffoni* de Cayenne, de Surinam et de la Guyane britannique, avec lesquels ils ont été comparés, par la coloration du dos qui est rayé en travers de brun et de jaunâtre sans aucune trace de gouttes jaunâtres propres à l'oiseau de la Guyane, par le sommet de la tête brun au lieu de noir et par le rouge frontal du mâle réduit à des points triangulaires très petits ne s'étendant qu'à la ligne du milieu de l'œil, tandis que chez l'oiseau de la Guyane les stries rouges sont longues et grosses, dépassant considérablement le niveau du bord postérieur des yeux; les raies foncées du dessous plus larges et moins nombreuses. Une femelle de Sarayacu (Coll. Berlepsch) paraît appartenir à la même forme.

Le jeune oiseau a les taches cephaliques oblongues et d'un blanchâtre sale, les raies claires dorsales et les bordures des tectrices alaires d'une nuance roussâtre; le jaunâtre du dessous moins pur.

♂. Longueur totale 98, vol 178, aile 52, queue 27, bec 14, tarse 10 mill.

238. PICUMNUS GRANADENSIS, Lafr.

Une femelle de Yaguachi recueillie en août. Iris brun grisâtre foncé.

Cette femelle paraît être en robe anormale très pâle, à stries du dessous à peine indiquées sur les côtés du corps.

*239. CAMPEPHILUS HÆMATOGASTER (Tsch.).

Un mâle de Mapoto tué en janvier. Iris cerise foncé.

240. CHLORONERPES MALHERBEI, Scl.

Trois mâles de San Rafael, recueillis en mars.

241. CHLORONERPES FUMIGATUS (d'Orb. et Lafr.).

Trois mâles de Machay et de Mapoto recueillis en décembre et en janvier.

242. CHLORONERPES CALLONOTUS (Waterh.).

Un mâle et deux femelles de Yaguachi recueillis en septembre et en mai.

243. Melanerpes pucherani (Malh.).

Mâle et femelle de Yaguachi pris en mai.

244. Hypoxanthus rivolii brevirostris (Tacz.).

Un mâle de San Rafael pris en mars.

Momotidæ.

245. Momotus microstephanus, Scl.

Un oiseau de Yaguachi.

Alcedinidæ.

246. Ceryle cabanisi (Tsch.).

Une paire de Yaguachi.

Trogonidæ.

247. Trogon personatus propinquus (Cab. et Hein.).

Cinq mâles et trois femelles pris à Machay, à Baños et à San Rafael depuis novembre jusqu'en mars.

248. Pharomacrus auriceps heliactin (Cab. et Hein.).

Un mâle de Machay pris en novembre. Longueur de l'aile 203, queue 180, bec 31 millimètres.

Galbulidæ.

*249. Galbula pastazæ, sp. n.

G. tombaceæ *simillima, sed major, dorso viridi non cupreo, abdomine intense rufo non ochraceo, rectricibus lateralibus totis cinnamomeis.*

♂ ad. Sommet de la tête vert changeant au bleu ; dessus du corps, ailes, poitrine et les quatre rectrices médianes d'un vert brillant prenant dans les autres directions de la lumière un léger ton bronzé, dans les autres cuivreux ; les plumes du menton sont blanchâtres à la base, terminées de vert obscur ; le reste de la gorge et le cou antérieur d'un vert semblable à celui du dos et prenant les mêmes éclats dans les différentes directions ; la poitrine, l'abdomen et les souscaudales d'un roux cannelle obscur, passant graduellement en une nuance moins foncée en s'approchant de la queue. Remiges primaires noires, les autres à barbe externe et l'extrémité verte ; sousalaires d'un cannelle moins foncé que la poitrine et le ventre ; barbe interne des remiges secondaires bordée de roux à la base. Les six rectrices latérales rousses sans rien de vert sur leur barbe externe. Bec noir ; pattes grises ; iris brun foncé.

Les jeunes ne diffèrent des adultes que par la gorge largement et longuement rousse, de sort qu'il ne reste qu'une bande verte peu large sur la région jugulaire ; le roux du dessous moins foncé.

♂	Longueur totale 250,	vol 300,	aile 88,	queue 106,	bec 45 mm.
♀	„ 267,	„ 308,	„ 91,	„ 130 ,	55 „

Cet oiseau diffère de la *G. tombacea* de Monterico (Pérou central) par une taille plus forte, l'éclat doré et cuivreux moins fort, le vert du dessous profondement échancré au milieu de la poitrine, le roux du dessous moins obscur, point de bordures vertes sur les rectrices rousses.

Les *G. tombacea* d'Yquitos (Coll. Berlepsch) sont aussi d'une taille plus petite; le mâle a le front brunâtre terne au lieu de bleuâtre et des bordures vertes sur les deux paires des rectrices externes.

Huit oiseaux de Mapoto et de Machay recueillis en décembre et janvier.

BUCCONIDÆ.

*250. MALACOPTILA FULVIGULARIS, Scl.

Deux mâles de Mapoto recueillis en janvier. Iris cerise.

CULCULIDÆ.

*251. CROTOPHAGA ANI, L.

Une femelle prise à Yaguachi le 11 mai.

Cet oiseau est de la taille de la *C. sulcirostris*, mais il a le bec de la *C. ani* à crête aussi élevée sans aucune trace de sillons latéraux.

Longueur de l'aile 132, queue 164, tarse 33, bec 26, hauteur du bec 22 millim.

*252. DIPLOPTERUS NÆVIUS, L.

Un adulte et un jeune de Yaguachi.

253. PIAYA CAYANA MESURA (Cab. et Hein.)?

Une femelle de Mapoto du 30 janvier.

*254. COCCYZUS LANDSBERGI, Bp.

Un mâle tué à Yaguachi le 2 juin. Iris brun foncé; tour de l'œil gris; mâchoire noire; mandibule grise et noire dans le tiers terminal; pattes cendrées.

RHAMPHASTIDÆ.

*255. RHAMPHASTOS TOCARD, Vieill.

Deux mâles de Mapoto, recueillis en janvier.

*256. ANDIGENA HYPOGLAUCUS (Gould).

Mâle et femelle de San Rafael recueillis en mars. Iris rouge cerise.

CAPITONIDÆ.

*257. CAPITO BOURCIERI (Lafr.).

Quatre mâles et trois femelles de Machay, recueillis en décembre et en janvier. Iris rouge cerise.

PSITTACIDÆ.

*258. CONURUS SOUANCÆI (Verr.).

Un mâle et deux femelles de Mapoto, pris en janvier et février. Iris brun grisâtre très foncé.

259. Brotogerys pyrrhoptera (Lath.).

Une paire de Yaguachi.

*260. Brotogerys jugularis, Deville.

Un jeune de Canelos. Iris brun foncé.

261. Pionus corallinus (Bp.).

Deux mâles et une femelle de Mapoto recueillis en janvier. Iris gris très foncé.

Les oiseaux de Chaguarpata sont d'une taille un peu moins forte, ont les bordures bleues des plumes cephaliques beaucoup moins larges, surtout celles des joues, qui manquent quelquefois ; le bleu moins répandu sur la région jugulaire, et la nuance plus olivâtre sur le dessous du corps ; le bleu moins largement disposé sur la barbe externe de la rectrice latérale, nul sur la suivante, tandis que la troisième a encore du bleu chez les oiseaux de Mapoto.

♂ Longueur de l'aile 210, queue 96 millim. (oiseau de Mapoto).
♀ „ „ 190, „ 88 millim. (oiseau de Chaguarpata).

262. Pionus seniloides (Mass.).

Deux oiseaux de San Rafael recueillis en mars. Iris brun foncé.

*263. Caica melanocephala (L.).

Un oiseau de Canelos pris en janvier.

264. Chrysotis ochrocephala (Gm.).

Un oiseau vivant de Naranchito (versant occidental).

*265. Chrysotis, sp.?

Un oiseau de Naranchito.

Cet oiseau présente une certaine affinité au *C. viridigenalis*, Cass. (*coccineifrons*, Souancé), mais il en diffère par une large bande sourcilière rouge réunie avec le rouge du front et prolongée en arrière vers la nuque ; les joues jusqu'à la région auriculaire sont d'un jaune verdâtre au lieu d'un vert frais, comme les tectrices auriculaires ; le milieu du sommet de la tête est couvert de plumes d'un lilas bleuâtre variées d'une manière irrégulière de rougeâtre ; le bec est noir au lieu de jaunâtre.

Comme cet oiseau a été élevé en captivité, on ne peut pas répondre s'il n'a pas subi quelque altération dans sa coloration ; mais M. Stolzmann a vu un autre, également en captivité, qui était tout-à-fait également coloré.

Strigidæ.

266. Glaucidium ferox (Vieill.).

Une paire rousse de Yaguachi.

*267. Glaucidium jardinei (Bp.).

Une paire de San Rafael tuée en mars.

♂ ad. D'un brun-chocolat très foncé en dessus et les ailes presque uniformes partout, à sommet de la tête immaculé excepté quelques stries blanchâtres fines au front et quelques beaucoup plus petites derrière les oreilles; une bande en chevron noirâtre au cou postérieur, variée de taches fauves et blanchâtres; quelques taches roussâtres sur les scapulaires, et une rangée de taches plus grosses et plus pâles le long du bord inférieur de l'aile; côtés de la tête bruns variés de blanchâtre; demicollier au col blanc, coloré de roussâtre sur la gorge, et bordé en dessous d'une raie brune; milieu même de la poitrine blanc, côtés largement d'un brun aussi foncé que celui du dos, parsemés de quelques taches fauves voisines du milieu et de stries très petites sur les côtés; abdomen d'un isabelle blanchâtre plus roussâtre au voisinage de la poitrine, varié de grosses flammèches brunes; souscaudales blanchâtres traversées chacune par une ligne médiane brune. Remiges noirâtres avec des taches blanc-roussâtres au bord de la barbe externe, blanches et grosses sur l'interne. Queue noire avec six rangées de taches blanches sur les deux bords de toutes les rectrices; page inférieure beaucoup plus pâle. Bec jaune pâle; iris jaune.

♀ Diffère du mâle précédent par tout le sommet de la tête parsemé de macules fauves un peu plus grosses au front et diminuant graduellement en s'approchant de la nuque; les taches plus blanches en partie sur les tectrices alaires, plus rousses sur la barbe externe des remiges; les côtés de la tête variés plus fortement de fauve; le collier jugulaire lavé de roussâtre; les taches roussâtres plus grosses sur la poitrine, le fond de l'abdomen plus roussâtre; queue semblable à celle du mâle.

♂	Longueur totale	176,	vol	370,	aile	100,	queue	66 millim.
♀	,,	190,	,,	390,	,,	106,	,,	68 ,,

*268. Ciccaba virgata (Cass.).

Un poussin tué à Machay en décembre. Iris noir bleuâtre.

Falconidæ.

*269. Harpyhaliaëtus coronatus (Vieill.).

Une jeune femelle de Rio Topo, tuée le 31 janvier. Iris brun grisâtre.

270. Buteo pennsylvanicus (Wils.).

Deux femelles de San Rafael tuées en mars. Iris blanchâtre et brunâtre dans sa partie inférieure.

*271. Cerchneis cinnamomina (Sws.).

Une paire de Riobamba et de Chimborazo. Iris brun foncé.

Columbidæ.

*272. Columba rufina, Temm.

Un mâle de Yaguachi tué en juin.

Ce mâle est d'une taille un peu plus petite que le mâle de Chirimoto (Pérou), et beaucoup plus forte que le mâle de Cayenne, la différence est surtout grande dans la longueur de la queue. Dans la coloration notre oiseau présente la plus grande différence dans le sommet de la tête, qui est longuement rouge dans les deux oiseaux cités, tandis que chez l'oiseau de Yaguachi le front est longuement rosé et le vert bronzé brillant commence plutôt ; le cou postérieur est violet passant au bleu sans rien de vert propre aux oiseaux cités. La queue est la plus caractéristique, tandis qu'elle est ordinairement terminée par une large bande gris pâle, bien tranchée de la couleur basale, elle est uniforme en dessus dans la longueur des rectrices, et la nuance pâle n'est distincte que sur la page inférieure sans être aussi nettement tranchée.

Longueur de l'aile 190, queue 123 mm. (oiseau de l'Ecuadeur).
„ „ 197, „ 122 „ (oiseau du Pérou).
„ „ 182, „ 102 „ (oiseau de Cayenne).

En général cet oiseau varie beaucoup en dimensions et en coloration de la tête. Le Comte Berlepsch a trouvé sur 30 exemplaires de Panama une différence de la longueur de l'aile entre 181 et 193. mill., de la queue entre 120 et 133.

273. Metriopelia melanoptera (Molina).

Deux oiseaux de Chimborazo recueillis en avril. Iris brun foncé.

*274. Chamæpelia passerina (L.).

Trois mâles et deux femelles recueillis à Riobamba le 1 mai. Iris rosé.

275. Chamæpelia buckleyi, Scl. et Salv.

Six mâles et quatre femelles de Yaguachi recueillis en septembre et en mai. Iris brun rougeâtre.

276. Peristera cinerea (Temm.).

Deux mâles et trois femelles de Yaguachi recueillis en mai.

*277. Peristera mondetoura, Bp.

Un mâle pris en mars au dessus de San Rafael.

278. Leptoptila pallida, Berl. et Tacz.

Une paire de Yaguachi recueillie en mai.

Le mâle ressemble beaucoup aux deux femelles de la *L. verreauxi* de Cutervo (Pérou), et ne s'en distingue que par l'éclat métallique beaucoup plus fort au cou ; le rosé du dessous pâle, mais beaucoup plus pur. Celui de Pedregal a le rosé du dessous beaucoup plus fort et beaucoup plus largement répandu jusqu'au milieu de l'abdomen.

279. Geotrygon bourcieri (Bp.).

Six exemplaires de Machay, de Baños et de San Rafael recueillis en novembre, février et mars. Iris jaune.

L'oiseau de Cutervo (Pérou) se distingue de tous ces oiseaux de l'Ecuadeur or. par le plombé du sommet de la tête beaucoup plus foncé et par l'éclat de la région interscapulaire vert et non bleu violet.

Cracidæ.

280. Penelope montagnii (Bp.).

Un mâle, quatre femelles et deux jeunes de San Rafael recueillis en février et en mars. Iris brun rougeâtre.

*281. Chamæpetes tschudii, Tacz.

Une femelle de Runacocha prise le 2 janvier. Iris brun rougeâtre.

Rallidæ.

282. Rallus virginianus, L.

Un mâle tué à Riobamba le 1 mai. Iris brun foncé.

Parridæ.

*283. Parra jacana (L.).

Un mâle de Yaguachi.

Thinocoridæ.

*284. Attagis chimborazensis, Scl.

Deux mâles et une femelle recueillis à San Rafael en mars. Iris brun noisette.

Scolopacidæ.

*285. Gallinago jamesoni, Bp.

Une femelle de Chimborazo tuée le 23 avril.

Laridæ.

*286. Phaëthusa magnirostris (Licht.).

Un mâle tué à Riobamba le 1 mai. Iris très foncé.

Tinamidæ.

*287. Nothocercus julius, Bp.

Trois femelles de San Rafael (9300 pieds). Iris brun grisâtre très foncé.

Ces oiseaux se distinguent d'un mâle de Bogota par la nuance des parties supérieures du corps plus foncée, plus olive et non roussâtre, à raies noires plus fortes ; le roux du sommet de la tête plus obscur, plus fortement ondulé de noir ; les joues beaucoup moins rousses ; la région jugulaire et les flancs du corps plus foncés et plus fortement rayés de noir.

*288. Nothocercus bonapartei (Gr.)?

Un mâle tué en décembre à Machay. Iris brun grisâtre très foncé.

Cet exemplaire se distingue de l'oiseau de Panama (Musée Berlepsch) par la coloration en général plus foncée, moins roussâtre au dos, à vermiculation foncée beaucoup plus dense ; les macules sur les ailes et sur le croupion blanches au lieu de roussâtres ; le bas ventre, les flancs et les tibias plus foncés à macules également blanches au lieu de fauves. La différence la plus frappante est dans les ailes, dont la barbe externe des remiges secondaires est brun noirâtre traversée de raies roussâtres fines, et l'espace foncé entre ces raies très peu varié, tandis que dans l'oiseau de Panama les raies rousses sont beaucoup plus larges, moins nettement dessinées et l'espace renfermé entre elles est de la couleur du fond général vermiculé de noirâtre ; la page inférieure des remiges est plus foncée et moins rousse dans notre oiseau ; sousalaires fortement rayées de brun foncé.

Longueur de l'aile 205, bec 47, tarse 65, doigt méd. 75, ongle 10 millim. (ois. de Machay).

Longueur de l'aile 222, bec 44·5, tarse 65, doigt méd. 56, ongle 11·5 millim (ois. de Panama).

289. Crypturus pileatus (Bodd.)?

Crypturus, sp.? Berl. et. Tacz. P. Z. S. 1883, p. 577.

Une femelle tuée en mai à Yaguachi.

Cet oiseau et celui de Chimbo présentent une grande ressemblance aux *C. pileatus* non adultes de Panama et de Veragua ; ils ont cependant les parties supérieures du corps beaucoup plus foncées, ce qui permet à supposer qu'ils appartiennent plutôt à une forme voisine mais distincte.

APPENDIX I.

En 1876 M. Jelski a pris à Palmal, forêt vierge humide sur le territoire de l'Ecuadeur, au voisinage du fleuve Tumbez, un oiseau voisin du *Xiphocolaptes promeropirhynchus* et du *X. compressirostris*, mais bien distinct par une taille moins forte et le bec plus robuste ; nous proposons donc à cette forme sud-ouest de l'Ecuadeur le nom et la diagnose suivantes :—

Xiphocolaptes crassirostris, sp. n.

X. promeropirhyncho *simillimus, sed statura minore, rostro robustiore, albido, gula pure isabellino-albida, abdomine medio toto subcaudalibusque nigro crebre ut in* X. compressirostri *maculatis, striis capitis et colli albidioribus, tectricibusque alarum albido striatis distinguendus.*

Ce Xiphocolapte diffère des deux formes citées par une taille moins forte, le bec plus épais et moins comprimé dans sa partie terminale à arête moins aigue, blanchâtre ; les pattes d'un plombé blanchâtre à ongles paraissant être plus courts à cause de leur courbure beaucoup plus forte, et de leur hauteur plus considérable, blancs, n'ayant qu'une ligne noirâtre au dos de l'extrémité. Dans la coloration la gorge est d'un blanc isabelle parfaitement uniforme ; la couleur du dos moins foncée que celle des deux formes citées ; le croupion aussi longuement roux que dans le *X. promeropirhynchus*, mais d'une nuance beaucoup plus claire et plus vive, tandis que chez le *X. compressirostris* le roux n'est présent que sur la partie postérieure du croupion et d'une nuance foncée ; les stries de la tête et du cou plus pâles que dans les deux autres formes sans aucune trace de bordures noires sur celles de la poitrine propres à la forme péruvienne ; le milieu de tout l'abdomen aussi fortement maculé de noirâtre que dans cette dernière ; toutes les tectrices alaires striées finement de blanchâtre ; le fond des sousalaires moins roussâtre.

Dimensions de ces trois formes :—

	X. crassirostris. millim.	*X. compressirostris.* millim.	*X. promeropirhynchus.* millim.
Longueur de l'aile........	135	150	175
„ de la queue	116	137	128
„ du bec	48·5	53	50
„ du tarse	29	32	30
„ du doigt médian.	24	29	28
„ de l'ongle......	11	12	12
„ de l'ongle du pouce	12	17	12
Hauteur du bec..........	12	12	10

APPENDIX II.

Considérations générales sur la Faune ornithologique de l'Equateur occidentale. Par Hans von Berlepsch.

M. Stolzmann ayant fini ses explorations dans la république de l'Equateur il me paraît utile de faire une revision des oiseaux qui habitent l'occident de ce pays, région le mieux exploré par ce voyageur instruit et infatigable.

Les deux collections précédentes faites par M. Stolzmann et son compagnon M. Siemiradzki, dont nous avons parlé dans les P. Z. S. 1883, pp. 536–577, et 1884, pp. 281–313, nous avaient fourni en tout 341 espèces, tous recueillies dans la contrée située à l'ouest de la grande chaîne des Andes, dans le voisinage de Guayaquil, Yaguachi et Chimbo (région de la côte), et dans des localités plus élevées jusqu'à une hauteur considérable, mais toujours de la pente occidentale.

Cette dernière collection dont nous venons de parler pour la plupart contient des espèces recueillies sur la pente orientale des Andes.

Il y a cependant quelques espèces supplémentaires pour la faune de l'occident recueillies à Yaguachi, près de Guayaquil. En outre il y a quelques espèces du mont Chimborazo, dont la faune sera aussi probablement à attribuer à celle de l'occident. Ce seront :—

1. Polioptila bilineata.
2. Spodiornis jardinei.
3. Molothrus purpurascens.
4. Lampropsar warszewiczi.
5. Hadrostomus homochrous.
6. Myiodynastes audax.
7. Cercomacra nigricans.
8. Crotophaga ani.
9. Coccyzus landsbergi.
10. Chrysotis ochrocephala.
11. ——, sp. inc.
12. Columba rufina.
13. Parra jacana.

Du Chimborazo.

14. Oreomanes fraseri.
15. Muscisaxicola alpina.
16. Synallaxis flammulata.
17. Leptasthenura andicola.
18. Cinclodes excelsior.
19. —— albidiventris.
20. Oreotrochilus chimborazo.
21. Gallinago jamesoni.

Le total d'espèces recueillies par M. Stolzmann dans l'occident montera donc au nombre 362.

Quant à nos listes précédentes il faut quelques rectifications :—

Dans la première liste il faut changer le nom de *Chlorostilbon melanorhynchus* en *C. atala*[1] (Less.). Quoique l'oiseau de Chimbo ne paraît pas tout-à-fait identique à l'oiseau de Trinidad, il n'en pourrait pas être distingué peut-être que comme race locale. Le *C. melanorhynchus*, Gld., de Quito est fort différent.

"*Mionectes striaticollis*" de la deuxième liste est *M. olivaceus*, Lawr.!

Il faut aussi changer le nom du "*Tyranniscus cinereiceps*" de Chimbo. C'est le *T. leucogenys*, Scl.

La "*Catamenia homochroa*" de Cechce (deuxième liste) n'est pas l'espèce de Mr. Sclater, mais une petite race de la *C. inornata* (Lafr.) : *C. inornata minor*, Berl.

Dans la première liste on pourrait encore changer :—

Parula pitiayumi en *P. pitiayumi pacifica*.
Spermophila obscura en *S. pauper*.
Sayornis nigricans en *S. cineracea*.
Synallaxis fruticicola en *S. elegantior fruticicola*.

Je suis à présent de l'avis que le *Turdus ignobilis maculirostris* pourrait figurer comme une bonne espèce : *T. maculirostris*, Berl.

La *Vireosylvia chivi griseobarbata* ne serait pas peut-être différente de la vraie *V. chivi*.

J'ai encore quelques doutes sur le *Troglodytes furvus albicans*. Peut-être que cette forme de Guayaquil sera distincte de l'oiseau de Chimbo, qui paraît identique au vrai *T. furvus* (mieux *musculus*, Naum.) de la Guiane.

Peut-être qu'il y aura aussi deux espèces de *Pheucticus* du type *chrysogaster* (voyez P. Z. S. 1883, p. 549, 1884, p. 292). Je ne suis pas encore sûr sur ce point.

En outre M. Taczanowski et moi nous avons encore des doutes sur le "*Crypturus*, sp." de Chimbo et de Yaguachi et le "*Chrysotis*, sp." de Naranchito. Ce seront probablement deux espèces nouvelles.

Alors pour compléter nos listes il me paraît nécessaire d'ajouter les espèces qui sont trouvées par Mr. Fraser et par d'autres voyageurs dans les localités citées (ou dans leur voisinage) mais qui n'y sont pas retrouvées par M. Stolzmann.

Il me paraît utile d'exclure de cette liste les oiseaux de Quito, Nanegal, Pichincha et des autres localités de l'occident, mais plus septentrionales, parce que leur faune est un peu différente de celle d'où viennent les collections de Stolzmann. Aussi on ne peut pas

[1] Mr. Sclater avait déjà déterminé les oiseaux de Fraser comme *Chl. atala*.— H. v. B.

être sûr si tous les oiseaux qu'on appelle généralement peaux de Quito étaient réellement recueillis dans le voisinage de cette ville, ou plutôt dans les régions de la pente orientale[1].

1. Cinnicerthia unibrunnea (Lloa).
2. Chlorospingus atripileus (Lloa).
3. Oreotrochilus pichincha (Pichincha).
4. Helianthea lutetiæ (Lloa).
5. Nyctibius pectoralis.
6. Colaptes elegans (Lloa).
7. Milvago carunculatus (Pichincha).
8. Strix "punctatissima" (Quito).
9. Vanellus resplendens ("Tableland").
10. Querquedula cyanoptera (R. Machangra).
11. Penelope argyrotis, Bp. (Mindo, W. Pichincha).

Oiseaux de Nanegal. (Coll. Fraser.)

12. Diglossa indigotica.
13. Buarremon castaneiceps.
14. Chlorospingus atripileus.
15. Calliste rufigularis.
16. —— vitriolina.
17. —— icterocephala.
18. Diva vassori.
19. Chlorochrysa phœnicotis.
20. Catamenia homochroa.
21. Synallaxis gularis.
22. Thamnistes æquatorialis.
23. Grallaria squamigera.
24. Tyrannulus nigricapillus.
25. Rhynchocyclus fulvipectus.
26. Myiobius villosus.
27. Agriornis solitaria.
28. Masius coronulatus.
29. Machæropterus deliciosus.
30. Rupicola sanguinolenta.
31. Thalurania verticeps.
32. Urosticte benjamini.
33. Heliangelus strophianus.
34. Hemistephania rectirostris.
35. Urochroa bougueri.
36. Syrnium albogulare.
37. Pholeoptynx cunicularia.

Oiseaux de Quito.

38. Turdus leucops, *Tacz.* Quito (*Mus. Brit.*).
39. Cinnicerthia unirufa. Quito (*Mus. Brit.*).
40. Chlorophonia flavirostris, *Scl.*
41. Calliste guttata, *Cab.* Mindos (*Bourc.*).
42. Iridornis porphyrocephala. Quito (*James.*).
43. Buthraupis cucullata. Quito (*James.*).
44. —— chloronota. Quito (*James.*).
45. Compsocoma notabilis. Quito (*James.*).
46. Dubusia selysia. Quito (*James.*).
47. Chlorospingus semifuscus, *Scl. & Salv.*
48. Buarremon pallidinuchus.
49. —— schistaceus.
50. Oreothraupis arremonops. Quito (*James.*).
51. Cyanocitta pulchra, *Lawr.*
52. Ochthoëca citrinifrons.
53. —— rufimarginata.
54. Thripadectes virgaticeps, *Lawr.* "Quito."
55. Margarornis guttata, *Lawr.* Quito.
56. Grallaria gigantea, *Lawr.*
57. Acropternis orthonyx.
58. ? Androdon æquatorialis.
59. Eutoxeres aquila heterurus.
60. ? Campylopterus lazulus.
61. Eugenia imperatrix.
62. Panoplites jardinei.
63. ? Calliphlox mitchelli.
64. Zodalia ortoni, *Lawr.* "Quito.
65. Pterophanes temmincki.
66. Ramphomicron herrani. Quito."
67. Urosticte ruficrissa, *Lawr.*
68. Patagona gigas. Quito (*Fraser*).
69. ? Eriocnemis mosquera.
70. —— smaragdinipectus.
71. ? —— godini.
72. ? —— nigrivestis.
73. —— derbyana.
74. ? —— lugens.
75. ? —— squamata.
76. —— aureliæ.
77. ? Eucephala grayi.
78. Chlorostilbon melanorhynchus, *Gld.* Quito.
79. Stenopsis ruficervix. Quito (*Gld.*).
80. Hapaloptila castanea (*Verr.*). Quito.
81. ? Aulacorhamphus derbianus.
82. Tetragonops rhamphastinus.
83. Sarcorhamphus æquatorialis.
84. Leucopternis albicollis. Quito (*Mus. Norwich*).
85. Accipiter nigroplumbeus, *Lawr.* Quito val. (*Orton*).

[1] Oiseaux du Pichincha (qui manquent à nos listes). (Coll. Fraser.)

De l'autre côté je comprends dans la liste les espèces d'Esmeraldas (de la côté du nord) parce qu'il me paraît que la faune de cette localité a beaucoup de rapport avec celle de Guayaquil et de Chimbo.

Il y a dont à ajouter :—

1. *Turdus gigas*, Fras. Pallatanga (*Fraser*[1]).
2. —— *reevei*, Lawr. Ile de Puna (*Reeve, Lawr.*).
3. *Myiadestes ralloïdes* (Lafr. et d'Orb.). Pallatanga et Babahoyo (*Fras.*).
4. *Thryophilus superciliaris* (Lawr.), ("*albipectus*, Cab."). Babahoyo (*Fras.*) ; Puna (*Reeve*).
5. *Dendrœca* "*aureola*, Gld." Esmeraldas (*Fras.*); Puna, Guayaquil (*Sundevall*).
6. *Progne chalybea* (Gml.) ("*dominicensis*"). Esmeraldas (*Fras.*).
7. *Buthraupis edwardi*, Elliot. Esmeraldas.
8. "*Tachyphonus delattrei*, Lafr., ♀." Pallatanga (*Fras.*).
9. *Hedymeles ludovicianus* (L.). Esmeraldas (*Fras.*).
10. *Oryzoborus occidentalis*, Scl. Babahoyo (*Fras.*).
11. —— *funereus*, Scl. Babahoyo (*Fras.*).
12. *Coturniculus*? Pallatanga (*Fras.*).
13. *Icterus grace-annæ*, Cass. Machala, près de Guayaquil (*Orton*).
14. *Cassidix oryzivora* (Gml.). Pallatanga (*Fras.*).
15. *Cyanocorax mystacalis* (Geoffr.). Guayaquil.
16. *Agriornis pollens*, Scl ("*andicola*"). Panza, Chimborazo (*Fras.*).
17. *Myiotheretes erythropygius*, Scl. Panza, Chimborazo (*Fras.*).
18. *Phrygilus unicolor* (Lafr. et D'Orb.). Panza, Chimborazo (*Fras.*).
19. *Copurus leuconotus*, Lafr. Esmeraldas (*Fras.*).
20. *Muscigralla brevicauda*, Lafr. et d'Orb. Babahoyo (*Fras.*).
21. *Euscarthmus pyrrhops*, Cab. Puna, S. Lucas (*Buckley*).

[1] Les espèces suivantes qui se trouvent dans les listes de Mr. Sclater sur les collections de Mr. L. Fraser me paraissent identiques à des espèces de nos listes, comme:—

Turdus "*albiventris*," de Pallatanga et Babahoyo,	= *T. maculirostris*?
Conirostrum "*albifrons*," Pallatanga,	= *C. atrocyaneum*?
Todirostrum "*ruficeps*," Pallatanga,	= *Pœcilotriccus rufigenis*.
Myiobius "*phœnicurus*," Pallatanga,	= *M. stellatus*.
"*Spiza* sp."?, Pallatanga,	= *Spodiornis jardinei*?
Todirostrum "*cinereum*," Babahoyo,	= *T. sclateri*.
Sittasomus "*erithacus*," Pallatanga,	= *S. amazonus*.
Cercomacra "*maculosa*," Pallatanga et Babahoyo,	= *C. nigricans*?
Phaëthornis "*guyi*," Pallatanga,	= *P. yaruqui*.
Chloronerpes "*rubiginosus*," Babahoyo,	= *C. canipileus*.
Trogon "*collaris*," Pallatanga,	= *T. virginalis*.
Glaucidium "*ferrugineum*" } —— "*infuscatum*" }	= *G. ferox*?
Penelope "*jacucaca*," Pallatanga,	= *P. ortoni*?
Leptoptila "*verreauxi*," Pallatanga,	= *L. pallida*?
—— "*albifrons*," Babahoyo,	= *L. verreauxi*?

—H. v. B.

22. *Hapalocercus fulviceps* (Scl.). Babahoyo (*Fras.*).
23. *Tyranniscus cinereiceps*, Scl. Pallatanga, Babahoyo (*Fras.*).
24. *Elainea pallatangæ*, Scl. Pallatanga (*Fras.*).
25. —— *placens*, Scl. ("*implacens*"). Babahoyo, Esmeraldas (*Fras.*).
26. *Myiozetetes texensis*, Giraud ? ("*columbianus*"). Esmeraldas (*Fras.*).
27. *Cnipodectes subbrunneus* (Scl.). Babahoyo, Esmeraldas (*Fras.*).
28. *Myiobius* "*barbatus* (Gml.)[1]." Babahoyo, Esmeraldas (*Fras.*).
29. *Tyrannus niveigularis*, Scl. Babahoyo (*Fras.*).
30. *Tityra personata*, Jard. et Selby. Esmeraldas (*Fras.*).
31. *Attila torridus*, Scl. Babahoyo (*Fras.*) ; St. Rosa (*Steere*).
32. *Ampelio cinctus* (Tsch.). Pallatanga (*Fras.*).
33. *Pipreola melanolæma*, Scl. Chillanes (*Fras.*).
34. *Synallaxis griseo-murina*, Scl. S. Lucas (*Villagomez*).
35. *Dendrornis triangularis*, Lafr.[2] Pallatanga (*Fras.*).
36. *Xiphocolaptes promeropirhynchus* (Less.). Pallatanga (*Fras.*).
37. *Thamnophilus albonuchalis*, Scl. Guayaquil (*Kellett*) ; Puna (*Barclay et Reeve*).
38. *Formicivora speciosa*, Salv. Puna (*Villagomez*).
39. *Terenura callinota*, Scl., ♀. Pallatanga (*Fras.*).
40. *Formicarius analis* (Lafr. et d'Orb.). Esmeraldas (*Fras.*).
41. *Glaucis ruckeri* (Bourc.). Esmeraldas (*Fras.*).
42. *Phaëthornis moorei*, Lawr. Esmeraldas (*Fras.*).
43. *Petasophora delphinæ* (Less.). Citado (*Buckley*).
44. *Panoplites flavescens* (Lodd.). Citado (*Buckley*).
45. *Rhamphomicron stanleyi* (Bourc. et Muls.)[3]. Panza, Chimborazo (*Fras.*).
46. *Chrysuronia humboldti* (Bourc. et Muls.). Miva, Esmeraldas.
47. *Polyerata amabilis* (Gould). Esmeraldas (*Fras.*).
48. *Dryocopus lineatus* (L.) ("*fuscipennis*"). Babahoyo et Esmeraldas (*Fras.*).
49. *Celeus loricatus*, Reichb. ("*undatus*, L."). Babahoyo (*Fras.*).
50. *Ceryle torquata* (L.). Babahoyo (*Fras.*).
51. *Trogon melanurus* (Sw.). Babahoyo (*Fras.*).
52. —— *caligatus*, Gould. Babahoyo (*Fras.*).
53. *Bucco dysoni*, Scl. ("*leucocrissus*"). Babahoyo (*Fras.*).
54. —— *subtectus*, Scl. Esmeraldas (*Fras.*).
55. *Monacha nigra* (Müll.). Guayaquil (*Wiener*).
56. *Crotophaga sulcirostris*, Sw. Babahoyo et Esmeraldas (*Fras.*) ; Puna (*Reeve*).
57. *Capito squamatus*, Salv. Santa Rita (*Buckley*).

[1] =*M. villosus*, Scl. ?
[2] =*D. erythropygia æquatorialis*, Berl. ?
[3] Mr. Fraser a aussi trouvé à Pallatanga la *Acestrura mulsanti*, espèce qui n'était pas observée dans les régions occidentales par Stolzmann. Mais je l'omets de cette liste parce qu'elle est déjà mentionnée dans notre deuxième article d'Alausi (pente orientale).—H. v. B.

58. *Chrysotis viridigenalis*, Cass. Guayaquil (*Mus. Bremen* etc.).
59. *Pionus menstruus* (Linn.). Babahoyo (*Fras.*).
60. *Pionopsitta pyrrhops*, Salv. Santa Rita et S. Lucas (*Buckley*).
61. *Cathartes aura* (L.). Babahoyo (*Fras.*).
62. —— *atratus* (Bartr.). Babahoyo (*Fras.*).
63. *Polyborus cheriway* (Jacq.). Puna (*Barclay, Mus. Brit.*); Babahoyo (*Fras.*, "*tharus*").
64. *Herpetotheres cachinnans* (Linn.). Babahoyo et Esmeraldas (*Fras.*).
65. *Ibycter americanus* (Bodd.). Guayaquil (*Barclay, in Mus. Brit.*).
66. *Geranospiza cærulescens* (Vieill.). Babahoyo (*Fras.*); Puna (*Barcl., Mus. Brit.*).
67. *Accipiter bicolor* (Vieill.), ("*pileatus*"). Pallatanga et Esmeraldas (*Fras.*).
68. *Antenor unicinctus* (Temm.). Pallatanga et Esmeraldas (*Fras.*); Puna (*Reeve*).
69. *Asturina magnirostris* (Gml.). Babahoyo et Pallatanga (*Fras.*).
70. —— *nitida* (Lath.). Babahoyo (*Fras.*).
71. *Urubitinga zonura* (Shaw). Babahoyo (*Fras.*).
72. —— *anthracina* (Nitzsch). Puna (*Reeve*).
73. *Heterospizias meridionalis* (Lath.). Babahoyo (*Fras.*).
74. *Gampsonyx swainsoni* (Vig.). Guayaquil (*Barclay, in Mus. Brit.*).
75. *Rostrhamus sociabilis* (Vieill.). Babahoyo (*Fras.*).
76. *Leptodon cayanensis* (Gml.). Babahoyo (*Fras.*).
77. *Cerchneis sparverius cinnamominus* (Sw.). Pallatanga (*Fras.*).
78. *Leucopternis occidentalis*, Salv. (Puna?)
79. "*Phalacrocorax*, sp." Babahoyo (*Fras.*).
80. *Ardea egretta* (Gml.). Babahoyo (*Fras.*).
81. *Tigrisoma brasiliense* (L.)[1]. Pallatanga et Babahoyo (*Fras.*).
82. *Nycticorax violaceus* (L.). Babahoyo (*Fras.*).
83. *Tantalus loculator*, Linn. Babahoyo (*Fras.*).
84. *Columba speciosa*, Gmel. Esmeraldas (*Fras.*).
85. *Ortalida erythroptera*, Scl. et Salv. Guayaquil (*Mus. Paris*); Babahoyo (*Fras.*).
86. *Aramus scolopaceus* (Gml.). Babahoyo (*Fras.*).
87. *Eurypyga helias*, Pall. Pallatanga (*Fras.*).
88. *Hoplopterus cayanus* (Lath.). Babahoyo (*Fras.*).
89. *Ægialites semipalmata* (Bp.). Puna (*Reeve*).
90. —— *collaris* (Vieill.). Babahoyo et Esmeraldas (*Fras.*).
91. *Himantopus nigricollis* (Vieill.). Babahoyo (*Fras.*).
92. *Micropalama himantopus* (Bp.). Babahoyo (*Fras.*).
93. *Gambetta flavipes* (Gml.). Babahoyo (*Fras.*).
94. *Limosa fedoa* (L.). Sta. Rosa (*Steere*).
95. *Querquedula andium*, Scl. et Salv. Paramo (*Fras.*).
96. *Fulica ardesiaca* (Tsch.) ("*chilensis*"). Paramo (*Fras.*).

[1] = *T. salmoni*, Scl. & Salv.?

97. *Attagis chimborazensis*, Scl. Chimborazo (*Fras.*).
98. *Rhynchops nigra*, Linn. Babahoyo (*Fras.*).
99. *Crypturus*, sp. ("voisin du *parvirostris*"). Babahoyo et Esmeraldas (*Fras.*).
100. *Mionectes striaticollis* (Lafr. et d'Orb.). Pallatanga (*Fras.*).
101. *Synallaxis tithys*, Tacz. Rio Zurumilla (*Felstin*).
102. *Heliangelus micraster* (Gould). S. Lucas, Prov. Losca (*Buckley*).

En outre il faut ajouter quelques espèces trouvées par Stolzmann à Palmal, au sud de la côte occidentale de l'Equateur :—

1. "*Pyranga azaræ.*"
2. "*Thamnophilus cæsius*, Licht."
3. "*Heteropelma wallacei.*"
4. *Ceryle inda* (L.).
5. *Xiphocolaptes crassirostris* de Palmal que nous venons de décrire.

Tout cela fait un total de 468 espèces connues des régions occidentales visitées par Stolzmann. Si nous ajouterons encore les 85 espèces de Pichincha, Nanegal et de Quito, dont je viens de donner la liste plus haut, nous aurions en tout 553 espèces de l'Equateur occidental.

C'est bien évident que nos listes des oiseaux de ces contrées sont encore très incomplètes. Il y manquent encore presque tous les oiseaux marins, et je suis sur qu'une exploration attentive des environs de Guayaquil etc. fournira aussi un bon nombre des petites espèces qui n'étaient pas encore connues comme habitants de ces régions.

Néanmoins le temps me paraît venu pour dire quelque chose en regard des relations de la faune de cette contrée avec celle des régions voisines [1].

Pour commencer, notre faune possède beaucoup d'espèces qui lui paraissent propres ou qui ne sont pas encore trouvées ailleurs. De cette catégorie je compte 63 espèces, dont voici la liste :—

	Remplacés dans l'Equateur oriental par :
Turdus reevei.	
—— maculirostris.	
Cyphorinus phæocephalus.	C. thoracicus dichrous.
Henicorhina hilaris.	H. leucosticta.
Microcerculus tæniatus.	M. marginatus?
Thryophilus nigricapillus (aussi Nanegal).	(en Antioquia *T. schotti*).
Thryothorus euophrys (aussi Lloa).	
—— paucimaculatus.	T. sclateri?
Cistothorus brunneiceps (aussi Pichincha).	
Geothlypis semiflava.	
Basileuterus fraseri.	
Hylophilus minor.	H. olivaceus.

[1] Je me borne toujours de parler sur les régions visitées par M. Stolzmann, et les comparaisons n'ont pas de rapport aux oiseaux des environs de Quito.—H. v. B.

	Remplacés dans l'Equateur oriental par:
Calliste cyanopygia.	C. cœruleocephala.
—— lunigera.	C. chrysotis.
Buthraupis edwardi.	
Chlorothraupis stolzmanni.	
Chlorospingus ochraceus.	C. melanotis?
Buarremon inornatus.	B. brunneinuchus.
—— leucopterus (aussi Quito).	
Spermophila ophthalmica (aussi Quito).	S. ocellata?
—— pauper.	
Chrysomitris siemiradzkii.	
? Ostinops atrocastaneus.	O. alfredi.
Pœcilotriccus rufigenis.	P. ruficeps.
Tyranniscus uropygialis.	
Elainea semipagana.	
Muscivora occidentalis.	M. castelnaudi?
Myiobius stellatus.	M. erythrurus.
Empidochanes griseipectus.	
Pachyrhamphus spodiurus.	P. cinereus?
Pipreola jucunda (aussi Nanegal).	
Cephalopterus penduliger.	C. ornatus.
Synallaxis erythrops.	
—— griseo-murina.	S. fuliginosa (?).
Automolus assimilis.	A. subulatus?
Thamnophilus unicolor.	T. capitalis?
Formicivora consobrina.	F. quixensis.
—— speciosa.	
Phaëthornis yaruqui (aussi Nanegal, Quito).	P. guyi?
Thalurania hypochlora.	
Heliodoxa jamesoni (aussi Nanegal).	
Phæolæma æquatorialis.	P. rubinoïdes.
Schistes personatus.	S. geoffroyi.
Diphlogæna hesperus.	(D. iris?)
Bourcieria fulgidigula.	B. torquata.
Steganura melananthera (aussi Nanegal).	
Chætocercus bombus.	
Chrysuronia humboldti.	(C. josephinæ?)
Amazilia dumerili.	
Agyrtria viridiceps.	(A. milleri?)
Trogon virginalis.	T. collaris.
Andigena laminirostris (aussi Nanegal).	(peut-être par *A. hypoglaucus*?)
Capito squamatus.	
Chrysotis, sp. inc.	
Pionopsitta pyrrhops.	
Bubo nigrescens.	
Leucopternis occidentalis.	
Leptoptila pallida.	
Penelope ortoni.	
Odontophorus erythrops.	
Aramides wolfi.	
Crypturus transfasciatus.	
——, sp. nov.	

Quelques espèces de l'orient se trouvent dans l'occident dans une forme un peu modifiée, comme :—

Troglodytes furvus albicans.
Parula pitiayumi pacifica.
Dacnis egregia æquatorialis.
Chlorophanes spiza exsul.

Tanagra palmarum violilavata.
Spermophila gutturalis olivacea.
Leptopogon superciliaris transandinus.
Megarhynchus pitangua chrysogaster.
Gouldia conversi æquatorialis.
Amazilia riefferi jucunda.
Chætura sclateri occidentalis.
Pharomacrus auriceps heliactin.
etc.

La faune de la côte a le plus grand rapport avec celle des environs de Tumbez sur la côte du Pérou septentrional. En effet de 128 espèces trouvées par Messrs. Jelski et Stolzmann à Tumbez et St. Luzia, il y a 88 qui sont aussi connues des environs de Guayaquil [1].

Il paraît qu'il y a 38 espèces qui sont conjointement propres aux contrées de Guayaquil et de Tumbez, pas encore trouvées ailleurs :—

Campylorhynchus balteatus.
Thryophilus superciliaris.
Cyclorhis virenticeps.
Euphonia hypoxantha.
—— saturata.
Arremon abeillæi.
Saltator flavidicollis.
Gnathospiza raimondi.
Coryphospingus cruentus.
Icterus grace-annæ.
Cyanocorax mystacalis.
Rhynchocyclus peruvianus æquatorialis.
Furnarius cinnamomeus.
Synallaxis stictothorax.
—— tithys.
Picolaptes souleyeti.
Xiphorhynchus thoracicus.
Lampornis iridescens.
Heliomaster albicrissa.
Myrmia micrura.
Fluvicola atripennis.
Muscigralla brevicauda.
Todirostrum sclateri.
Phyllomyias tumbezana.
Ornithion sclateri.
Elainea subplacens.
Myiodynastes atrifrons.
Myiobius crypterythrus.
Myiarchus phæocephalus.
Tyrannus niveigularis.
Hadrostomus homochrous.
Contopus punensis.
Picumnus sclateri.
Conurus erythrogenys.
Brotogerys pyrrhoptera.
Psittacula cœlestis.
Campephilus sclateri.
Chamæpelia buckleyi.

Il y a des autres espèces trouvées à Guayaquil qui sont répandues vers la côte du Pérou jusqu'à Lima, comme :—

? Dendrœca aureola.
Mimus longicaudatus.
Thamnophilus albinuchalis (jusqu'à Paucal).
Neorhynchus nasesus.
Spermophila telasco.
Euscarthmus fulviceps.

Un bon nombre d'espèces se répandent de Guayaquil vers le nord à travers de la région la plus occidentale de la Colombie jusqu'à Panama ou plus au nord de l'Amérique central, comme :—

Turdus obsoletus. (Panama ; Costa Rica.)
Embernagra striaticeps. (Panama ; Costa Rica.)

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[1] Les autres 40 espèces de Tumbez qui ne sont pas encore trouvées à Guayaquil, pour la plupart sont des oiseaux d'une distribution étendue qui probablement seront aussi habitants de l'Equateur. Cependant il y a quelques-unes qui jusqu'à présent ne sont pas encore trouvées ailleurs, comme *Geothlypis* sp., *Camarhynchus cinereus, Hæmophila stolzmanni, Ochthoëca salvini, Elainea leucospodia, Rallus cyperti, Penelope albipennis.* Peut-être qu'ils sont propres à la région de Tumbez, peut-être qu'ils seront aussi constatés dans l'Equateur quand la faune de la côte sera mieux étudiée.—H. v. B.

Atticora tibialis. (Antioquia, Panama.)
Cnipodectes subbrunneus. (Antioquia, Panama.)
Platyrbynchus albigularis. (Veragua; Pérou du nord.)
Cassicus flavicrissus. (Panama; Lechugal, Pérou.)
—— prevosti. (Mexique; Tumbez, Pérou.)
Icterus mesomelas. (Mexique; Pérou du nord.)
Dendrornis erythropygia, subsp. (Jusqu'en Mexique.)
Rhamphocænus rufiventris. (Guatemala, Antioquia.)
Myrmeciza exsul. (Panama, Antioquia.)
Hypocnemis nævioides. (Panama; Costa Rica.)
Anabazenops subalaris. (Veragua, Costa Rica.)
Glaucis ruckeri. (Panama; Costa Rica.)
Heliothrix barroti. (Panama; Costa Rica.)
Celeus loricatus. (Panama.)
Galbula melanogenia. (Jusqu'en Mexique.)
Trogon caligatus. (Jusqu'en Mexique.)
Bucco subtectus. (Antioquia, Panama, Veragua.)
Melanerpes pucherani. (Jusqu'en Mexique.)
Pteroglossus erythropygius? (Nicaragua!)
Micrastur guerilla. (Jusqu'en Mexique.)
Columba subvinacea. (Jusqu'en Costa Rica.)

Quant aux régions plus élevées de notre faune, il y a quelques espèces conjointement propres à leur faune et à celle des Andes du Pérou du nord, comme:

Anæretes parulus æquatorialis.
Picolaptes lacrymiger warszewiczi.
Heliotrypha viola.
Panoplites mathewsi.
Lesbia gouldi gracilis.
Lurocalis rufiventris.
Hypoxanthus rivolii brevirostris.
Elainea pallatangæ.
Ampelio cinctus. Pérou central.
Spodiornis jardinei. Pérou central.
Heliangelus micraster.

La comparaison avec la faune de l'Equateur orientale est difficile parce qu'on n'a pas encore publié des listes suffisantes des oiseaux de cette région. Messrs. Sclater et Salvin disent que Mr. Buckley y a recueilli à peu près 800 espèces. Il est donc évident que cette dernière faune est beaucoup plus riche en espèces que celle de l'occident. Bien dommage que jusqu'à présent une liste complète des collections de Mr. Buckley n'a pas encore paru; mais j'espère que nous la recevrons encore parce qu'il y a des représentants de toutes les espèces de la collection Buckley contenues au musée Salvin-Godman.

De ce que nous connaissons des oiseaux de l'orient il paraît que de 468 espèces des régions occidentales à peu près 220 se trouvent aussi sur la pente orientale, ce sera à peu près la moitié. Il y aura peu d'espèces qui sont conjointement *propres* à la faune de l'occident et de l'orient, comme:—

Conirostrum fraseri.
Chlorospingus phæocephalus.
Buarremon spodionotus.
Pionus seniloides.
Geotryon bourcieri.
Nothoprocta curvirostris.
Tyranniscus cinereiceps.
etc.

Des 468 espèces de notre faune il y aura à peu près 200 qui se trouvent dans les collections de Bogota (Nouvelle Grenade orientale).

La faune d'Antioquia possède aussi quelques espèces de notre région qui ne sont pas encore trouvées ailleurs, comme : *Automolus holostictus* et *A. ignobilis*.

Du reste il faut remarquer que quelques espèces ne se trouveront dans les régions dont nous parlons que de passage en hiver. Ils nichent dans l'Amérique du nord, dans les Etats Unis et quelques-unes plus au nord encore. Les voila :—

Turdus swainsoni.	Rallus virginianus.
Setophaga ruticilla.	Porzana carolina.
Pyranga æstiva.	? Nycticorax violaceus.
Hedymeles ludovicianus.	Hoplopterus cayanus.
Dendroëca blackburniæ.	Ægialites semipalmata.
Empidonax acadicus.	Gambetta flavipes.
Contopus richardsoni.	Micropalama himantopus.
Coccyzus americanus.	Tringoïdes macularius.
Buteo pennsylvanicus.	Limosa fedoa.

2. On the Lepidoptera of Bombay and the Deccan. By Lieut.-Col. C. Swinhoe, F.L.S., F.Z.S.—Part I. Rhopalocera.

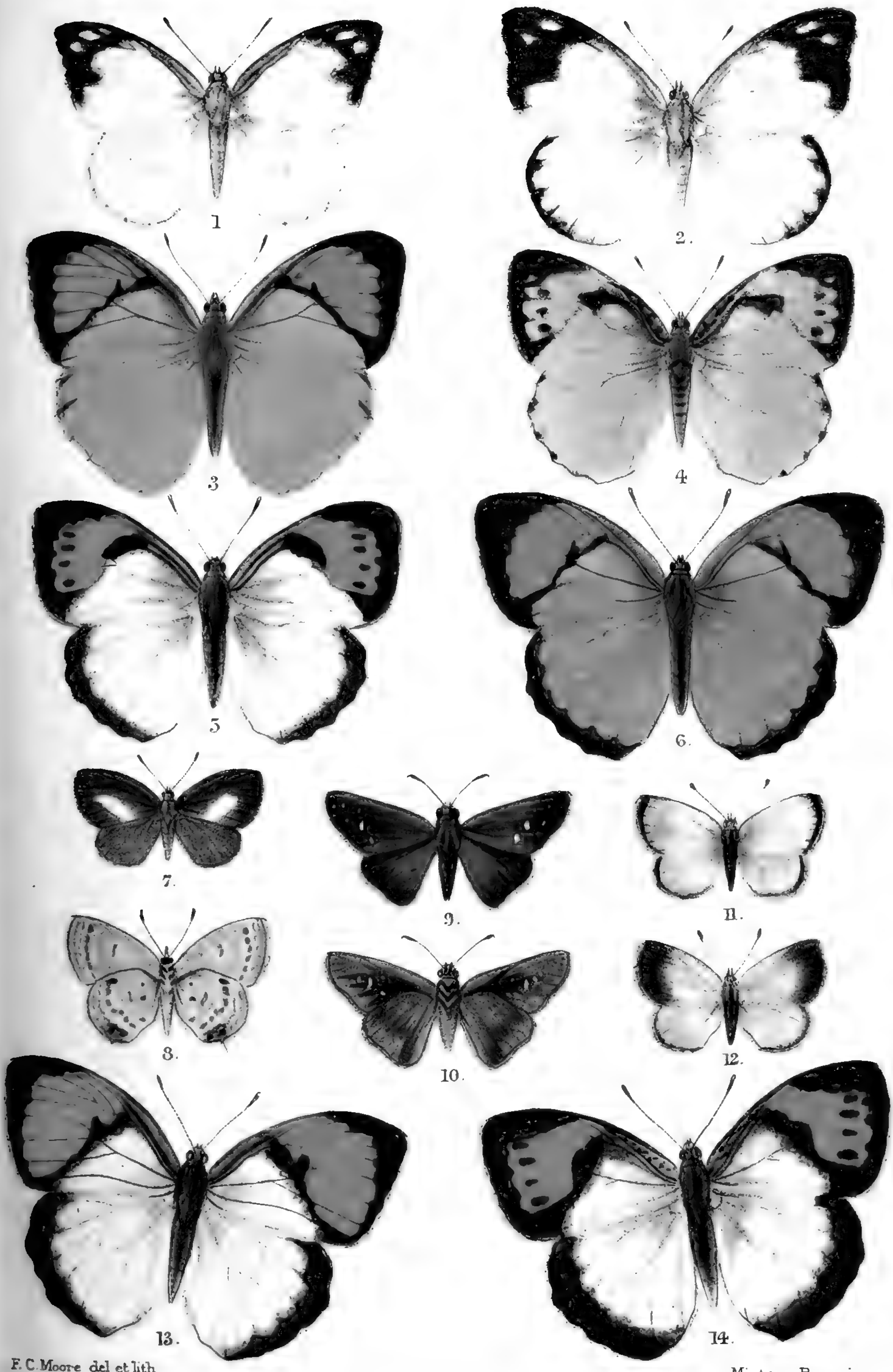
[Received January 9, 1885.]

(Plate IX.)

The contents of this paper show the results of two years' daily collections and observations made by me personally at Poona and Bombay in 1882–83, and also for a short time in 1877. At the latter place I kept a large number of breeding-cages and had a great many Moths; and Mr. Taplin did the same on my account at Poona, and collected very largely for me at that place during the time my duties kept me in Bombay. Out of the two years I remained ten months in Poona, and the remainder of the time in Bombay; and during the whole period I had a trained native collector in my employment, who collected every day, and I have kept a careful record of the numbers of each description of Butterfly and Moth captured by him each day; I can therefore certify to the absolute correctness of the dates given, and whenever it is stated that any particular insect occurs from, say, May to December, it means that I actually got that insect in every month from May to December.

Mr. Kennedy collected for me at Ahmednuggur, and Major Hughes and Mr. Skinner at Belgaum. I brought home over ten thousand duplicates, all of which have been set up and carefully compared; and I have given types of every insect mentioned in this paper to the British Museum.

Lord Walsingham has very kindly worked out the Tineina and Tortrices; and Mr. Butler and Mr. Moore have given me great assistance in examining the national collection and the magnificent private collection of the latter.



F. C. Moore del et lith.

Mintern Bros. imp.

NEW INDIAN LEPIDOPTERA.

NYMPHALIDÆ.

EUPLŒINÆ.

1. TIRUMALA LIMNIACE.

Pap. limniace, Cramer, Pap. Exot. i. pl. 59. figs. D, E (1775).
Common everywhere all the year round.

2. PARANTICA MELANOIDES.

Parantica melanoides, Moore, P. Z. S. 1883, p. 247.
Poona, November; Mahableshwur, May; Bombay.

3. PARANTICA AGLEA.

Pap. aglea, Cramer, Pap. Exot. iv. pl. 377. fig. E (1782).

Poona, June, November, and December; Belgaum; Mahableshwur; Bombay.

This insect is almost identical with *P. grammica,* Boisd., from Java, but is quite distinct from *P. melanoides.* In the former the lower subapical streak runs in close to the cell-streak in the fore wings, just below the centre of the first subcostal spot; whereas in the latter species there is a wide division between the two streaks, the two subapical streaks have both their inner ends together, and are just below the innerside of the second subcostal spot; there are also other distinct differences which are very constant in the many examples of both species in my collection.

4. SALATURA GENUTIA.

Pap. genutia, Cramer, Pap. Exot. iii. pl. 206. figs. C, D (1779).
Common everywhere all the year round.

5. LIMNAS CHRYSIPPUS.

Pap. chrysippus, Linn. Syst. Nat. p. 471 (1758).
Var. *alcippoides,* Moore, P. Z. S. 1883, p. 238, pl. 31. fig. 1.

Common everywhere all the year round. Varieties with more or less white in the hind wings occur here and there; I have them of all sorts and colours, from different parts of India; commencing with some taken in Bombay, in which the veins only are white, a Mhow example with merely a discal white patch, and Kurrachee examples in some of which the hind wing is nearly all white and some only part white; and in none of these is the lower discal spot on the red area of the fore wings, which is one of the distinguishing marks of Moore's type of *L. alcippoides,* whereas I have one true *L. chrysippus* female taken at Kurrachee with this spot clear and large. It is impossible to separate these white-marked insects from the true *L. chrysippus*, because a long series will show a regular gradation, from no white to all white in the hind wings; and this is also the case with the following species, which I believe to be a true species. It has also many varieties of white on the hind wings, and

Mr. Butler has pointed out to me that Klug's type of *L. dorippus* has white hind wings, a fact which appears to have been entirely overlooked; but this does not entitle the *all red L. dorippus* to a new name, because Klug happens to have figured an inconstant variety instead of the normal form.

6. LIMNAS DORIPPUS.

Euplœa dorippus, Klug, Symb. Phys. pl. 48. figs. 1–5 (1829).

Poona, October and December; Khandalla, October; Bombay, August.

7. CRASTIA CORE.

Pap. core, Cramer, Pap. Exot. iii. pl. 266. figs. E, F (1780).
Euplœa vermiculata, Butler, P. Z. S. 1866, p. 276.

Common everywhere all the year round; the variety *E. vermiculata* is very plentifully met with throughout the whole district, and there are so many intermediates, that it is impossible to separate the two forms.

8. PADEMMA KOLLARI.

Euplœa kollari, Felder, Reise Nov., Lep. ii. p. 325 (1867), ♂.

Poona, September; Bombay, August.

Is not often met with, but I do not believe it is rare; it so exactly resembles *E. core* in coloration that it is passed over as *E. core*. In September in Poona, and again in the following August in Bombay, I made my collector catch every *E. core* he could find, and thus got a few *E. kollari* in each place; it is quite distinct from *P. sinhala* of Ceylon. The female is very similar in all its markings to the male, and only differs in the absence of the whitish sexual patch in the cell of the hind wings, and in having the hinder margin of the fore wings straight. I have several examples taken with males from Calicut, where this species is quite common.

SATYRINÆ.

9. MELANITIS LEDA.

Pap. leda, Linn. Syst. Nat. i. 2, p. 773 (1767).

Common in all moist places from July to October.

10. MELANITIS ISMENE.

Pap. ismene, Cramer, Pap. Exot. i. pl. 26. figs. A, B (1775).

Common in all moist places all the year round; very plentiful in winter.

11. CALYSISME PERSEUS.

Pap. perseus, Fabr. Syst. Ent. p. 488 (1775).

Poona, October and November; Bombay, October.

Not common.

12. Calysisme visala.

M. visala, Moore, Cat. Lep. E. I. C. i. p. 230 (1857).

Poona, October.

Taken in company with the above.

13. Ypthima alemola, n. sp.

Poona, October to June.

Very common. Allied to *Y. asterope*, Hübner, and *Y. mahratta*, Moore.

♂ ♀. Upper side very similar to *Y. asterope*, which is an African insect. Underside much paler and of a different hue, greyish white, very plentifully covered with pale reddish-brown striæ, more dense in the fore than in the hind wings; fore wings with a brown fascia from the costa round the ocellus back to the costa, diffuse and deep below the ocellus; hind wings with three sinuous fasciæ across the wing—first before the middle, second beyond the middle, third submarginal; one or other of these fasciæ is very often obsolete. The striæ are denser towards the base of the wing, leaving the outer half of the wing whitish; two anal and one apical blind dot, in the place of the well-formed ocelli with yellow rings of *Y. asterope*; one or other of these dots is often wanting, in some specimens all are wanting.

I have examined over two hundred examples of this species.

Expanse of wings $1\frac{2}{10}$–$1\frac{4}{10}$ inch.

14. Ypthima huebneri.

Y. hübneri, Kirby, Syn. Cat. D. L. p. 95 (1871).

Y. philomela, Hübner (nec Linnæus), Zur. Exot. Schmett. figs. 83, 84 (1818).

Mahableshwur, May.

15. Ypthima baldus.

Pap. baldus, Fabr. Syst. Ent. App. p. 829.

Bombay, November.

16. Ypthima mahratta.

Y. mahratta, Moore, Journ. As. Soc. Bengal, vol. liii. pt. 2, no. 1, p. 1 (1884).

Bombay, October and November.

17. Lethe neelgherriensis.

Satyrus (*Cyllo*) *neelgherriensis*, Guérin in Delessert's Voy. dans l'Inde, pt. 2, p. 74, pl. 21. figs. 1, 1*a* (1843).

Belgaum, no date; Poona, November.

Acræinæ.

18. Telchinia violæ.

Pap. violæ, Fabr. Syst. Ent. p. 460 (1775).

Poona, January to April; Bombay, September.

Nymphalinæ.

19. Cethosia mahratta.

C. mahratta, Moore, P. Z. S. 1872, p. 556.

Belgaum.

A very rare insect in the Mahratta country, but quite common at Calicut.

20. Atella phalanta.

Pap. phalanta, Drury, Ill. Ex. Ent. i. pl. 21. figs. 1, 2 (1773).

Common everywhere.

I took it at Poona in every month except July, August, and September, and in Bombay from July to December.

21. Argynnis niphe.

Pap. niphe, Linn. Syst. Nat. i. 2, p. 785 (1767).

Bombay, 1877; I took several examples, but have not observed it since.

22. Pyrameis cardui.

Pap. cardui, Linn. Faun. Suec. p. 276 (1761).

Common everywhere from September to December.

23. Pyrameis indica.

Pap. indica, Herbst, Nat. Schmett. vii. t. 180. figs. 1, 2 (1794).

Bombay. I took several examples in 1877, but have not observed it since.

24. Junonia lemonias.

Pap. lemonias, Linn. Mus. Ulr. p. 277 (1764).

Commonly found in ditches all the year round.

25. Junonia hierte.

Pap. hierte, Fabr. Ent. Syst. Suppl. p. 424 (1798).

Commonly found in ditches all the year round.

26. Junonia orythia.

Pap. orythia, Linn. Mus. Ulr. p. 278 (1764).

Commonly found in ditches all the year round.

27. Junonia asterie.

Pap. asterie, Linn. Syst. Nat. i. 2, p. 769 (1767).

28. Junonia almana.

Pap. almana, Linn. Mus. Ulr. p. 272 (1764).

The latter is common everywhere all the year round; the former (*I. asterie*) is common in the latter half of the year. I am convinced that although the types of each are so different they are both one and the same insect, one being the normal and the other the dimorphic form, though unfortunately I have not yet been able to produce both from the eggs of what I actually know to be one female. Mr. Aitken in Bombay produced both from the same group of larvæ taken together; and I have a long series of examples showing every stage of variety between the two.

29. Precis iphita.

Pap. iphita, Cramer, Pap. Ex. iii. pl. 209. figs. C, D (1782).

Poona, June; Matheran, May; Belgaum, September and October, in great plenty; Bombay, October and November, common.

30. Kallima wardi.

Kallima wardi, Moore, Trans. Ent. Soc. 1879, part i. p. 14.

Poona, August; Khandalla ghats, August.

A very difficult insect to capture, as it keeps to the tops of the trees on the slopes of the hills.

31. Ergolis ariadne.

Pap. ariadne, Linn. Syst. Nat. i. 2, p. 778 (1767).

Poona, September to February; Mahableshwur, May; Bombay (no date).

32. Hypanis polinice.

Pap. polinice, Cramer, Pap. Ex. iv. pl. 375. figs. G, H.

Poona, September to December; Ahmednuggur, June to November.

33. Hypanis simplex.

Hypanis simplex, Butler, P. Z. S. 1883, p. 146, pl. 24. f. 8.

Poona, September to January.

34. Hypolimnas bolina.

Pap. bolina, Linn. Mus. Ulr. p. 295 (1764).

Common everywhere from July to January.

35. Hypolimnas avia.

Pap. avia, Fabr. Ent. Syst. iii. 1, p. 111 (1793).

Common everywhere all the year round.

36. Hypolimnas misippus.

Pap. misippus, Linn. Mus. Ulr. p. 264 (1764).

Common everywhere throughout the year; very plentiful in the winter. The female commonly has the coloration and markings of *Limnas dorippus*.

37. Neptis astola.

Neptis astola, Moore, P. Z. S. 1872, p. 560.

Matheran, May; Sattara, November; Poona and Bombay from September to December. Found in hilly districts.

38. Athyma leucothoë.

Pap. leucothoë, Linn. Mus. Ulr. p. 292 (1764).
Belgaum, Khandalla, December; in hilly places.

39. Euthalia garuda.

Adolias garuda, Moore, Cat. Lep. E. I. C. vol. i. p. 186 (1857).
Common everywhere from October to May.

40. Symphædra nais.

Pap. nais, Forst. Nov. Spec. Ins. p. 73 (1771).
Pap. thyelia, Fabr. Ent. Syst. iii. 1, p. 142 (1793).
Belgaum, Poona, April.

41. Charaxes samatha.

Charaxes samatha, Moore, P. Z. S. 1878, p. 831.
Matheran, December.

42. Charaxes fabius.

Pap. fabius, Fabr. Spec. Ins. ii. p. 12 (1781).
Poona, February, April, November; Belgaum; Bombay, November.

Lemoniidæ.

Libythæinæ.

43. Libythea lepita.

L. lepita, Moore, Cat. Lep. E. I. C. vol. i. p. 240 (1857).
Bombay.

44. Libythea myrrha.

L. myrrha, Godt. Enc. Méth. ix. p. 171 (1810).
Bombay.

Nemeobiinæ.

45. Abisara fraterna.

Abisara fraterna, Moore, P. Z. S. 1883, p. 532.
Poona, September; Khandalla, November; Bombay.

46. Dodona eugenes.

Dodona eugenes, Bates, Journ. Linn. Soc., Zool. ix. p. 371 (1867).
Bombay.

Lycænidæ.

47. Polyommatus bæticus.

Pap. bæticus, Linn. Syst. Nat. ii. p. 789 (1766).
Common everywhere, from October to June; there are three or

four broods in succession; the butterfly varies very much in size, and some of those taken in the winter are very diminutive.

48. LAMPIDES ÆLIANUS.

Hesperia ælianus, Fabr. Ent. Syst. iii. 1, p. 280 (1793).

Poona, October, November, and March; Belgaum, September; Bombay, October.

49. LAMPIDES ALEXIS.

Pap. alexis, Stoll. (nec Scop.), Suppl. Cram. pl. 38. figs. 3–3 C (1790).

Poona, November to April; Bombay, November and December.

50. JAMIDES BOCHUS.

Pap. bochus, Cramer, Pap. Exot. iv. pl. 391. figs. C, D (1782).

Poona, November, January, and June; Bombay, October to December.

51. CATOCHRYSOPS STRABO.

Hesperia strabo, Fabr. Ent. Syst. iii. 1. p. 287 (1793).

Lyc. kandarpa, Horsf. Cat. Lep. E. I. C. vol. i. p. 82 (1829).

Poona, very plentiful all the dry season from October to June; Bombay, observed in December only.

52. CATOCHRYSOPS CNEJUS.

Hesperia cnejus, Fabr. Ent. Syst. v. Suppl. p. 430 (1798).

Poona, April to June; Bombay, August to December.

53. CATOCHRYSOPS PATALA.

Lyc. patala, Kollar, Hüg. Kaschm. iv. 2, p. 418 (1848).

Poona, November to May.

54. CATOCHRYSOPS HAPALINA.

Catochrysops hapalina, Butler, P. Z. S. 1883, p. 148, pl. 24. figs. 2, 3.

Poona, January to May.

55. CATOCHRYSOPS THESEUS, n. sp. (Plate IX. fig. 8.)

Bombay, October.

♂. Above like *C. cnejus*, below greyish white; fringe grey on fore wings, markings greyish brown, marginal line brown, submarginal and discal macular lines arranged as in *C. hapalina*, but the markings broader, the spots running into each other forming two almost clear bands; hind wing with a subcostal black spot near the base and another below it, a lunular streak at the end of the cell, two black spots on an orange ground near the anal angle; border greyish brown; submarginal and discal whorl of markings as in *C. cnejus*, but darker, broader, and running into each other, almost forming bands; the discal band commencing with a longitudinal subcostal deep black streak; all the markings in both wings surrounded by whitish.

Expanse of wings $1\frac{2}{10}$ inch.

56. Catochrysops nicola, n. sp.

Poona, December.

♀. Upper side pale blue; both wings with broad costal and outer black borders, deepest at the apex; hind wings with five marginal largish black spots surrounded by yellowish commencing near the anal angle, one in each interspace, with whitish streaks above each spot: underside pale greyish, markings greyish brown surrounded by white, a streak at end of each cell, a whorl of discal square spots, a row of marginal and submarginal square spots, the submarginal spots having a white band internally; a subbasal centre spot and three others below it in a line, and two black spots on orange ground near anal angle.

Expanse of wings $1\frac{2}{10}$ inch.

This is closely allied to *C. pandava*, and may probably be only a local form of that species.

57. Zizera ossa, n. sp. (Plate IX. figs. 11 ♂, 12 ♀.)

Poona, September to June; Bombay, September to October.

Pale bluish grey above; costa and outer border of all the wings black; the breadth of the outer border of the fore wings differs a little in the males, but is much wider in the females, is diffused inwardly, and often occupies nearly half the wing; underside pale brownish grey, with the markings as in *Zizera maha*, Kollar, and *Zizera diluta*, Felder.

Expanse of wings $1\frac{1}{10}$ inch.

A very distinct and pretty little species; in great plenty in Bombay during September.

58. Zizera indica.

Lycæna indica, Murray, Trans. Ent. Soc. 1874, p. 525.

Poona, December to June; Ahmednuggur, June.

59. Zizera karsandra.

Polyommatus karsandra, Moore, P. Z. S. 1865, p. 505, pl. 31. fig. 7.

Poona, September to April; Bombay, August; Sattara, November; Ahmednuggur, August to November.

60. Zizera pygmæa.

Lycæna pygmæa, Snellen, Tijd. voor Ent. xix. pl. 7. fig. 3 (1876).

Bombay, November; Poona, January to March.

61. Nacaduba ardates.

Lycæna ardates, Moore, P. Z. S. 1874, p. 574, pl. 67. fig. 1.

Poona, March, June, and November; Belgaum, September; Ahmednuggur, June; Bombay, July, September, and November.

62. Chilades laius.

Papilio laius, Cramer, Pap. Exot. iv. pl. 319. figs. D, E (1782).
Poona, October to June.

63. Chilades varunana.

Polyommatus varunana, Moore, P. Z. S. 1865, p. 772, pl. 41. fig. 6.
Poona, May.

64. Talicada nyseus.

Polyommatus nyseus, Guérin-Ménéville, in Delessert's Souv. Voy. Inde, pt. ii. p. 78, pl. 22. figs. 1, 1*a* (1843).

Poona, September to June; Belgaum, September and October. A very local insect.

65. Cyaniris albidisca.

Cyaniris albidisca, Moore, P. Z. S. 1883, p. 524, pl. 68. fig. 7.
Poona, January.

66. Megisba gunga, n. sp. (Plate IX. fig. 7.)

Poona, March.

Above black; fore wings with a white patch in the centre, extending from below the cell to the hinder margin; hind wings with an apical and anal underneath spot showing through; otherwise unmarked; fringe white.

Underside milk-white; wings with a streak at end of each cell; a few marks on costa of fore wings, marginal lines, a row of submarginal marks, then another line and a row of discal streaks, and on hind wings a further middle row of streaks, all very thin and of a reddish-grey colour; hind wing with a black subcostal spot, a spot on centre of anal margin, a spot between these spots, one near the apex and another near the anal angle.

Expanse of wings $1\frac{1}{10}$ inch.

67. Castalius rosimon.

Pap. rosimon, Fabr. Mant. Ins. ii. p. 71 (1787).

Poona, January and February, March and May; Bombay, October to December.

68. Castalius chota, n. sp.

Smaller than typical *C. rosimon*. Upper side with the marginal bands in both sexes narrow, and the discal spots smaller. On the underside of both wings the spots are also much smaller.

Expanse $\frac{7}{10}$ to $\frac{9}{10}$ inch.

Poona, February, May.

69. Tarucus plinius.

Hesperia plinius, Fabr. Ent. Syst. iii. pt. 1, p. 284 (1793).

Poona, September to June, very plentiful; Sattara, June and November; Bombay, July, September, and December.

70. Tarucus nara.

Lycæna nara, Kollar, Hüg. Kaschm. iv. 2, p. 421 (1848).
Poona, October, December, January, April, and May; Bombay, July to December; Ahmednuggur, August and September.

71. Tarucus theophrastus.

Hesperia theophrastus, Fabr. Ent. Syst. iii. pt. 1, p. 281 (1793).
Poona, September, November, and January; Bombay, October.

72. Azanus ubaldus.

Pap. ubaldus, Cramer, Pap. Exot. iv. pl. 390. figs. L, M (1782).
Poona, November and January.

73. Azanus zena.

Lycæna zena, Moore, P. Z. S. 1865, p. 505, pl. 31. fig. 9.
Poona, November to January and in August; Ahmednuggur, June, August, and September.

74. Aphnæus elima.

Aphnæus elima, Moore, Ann. & Mag. Nat. Hist. ser. 4, vol. xx. p. 51 (1877).
Poona, November to May.

75. Aphnæus tigrinus.

Aphnæus tigrinus, Moore, Journ. As. Soc. Bengal, 1884, p. 10.
Poona, October, December, May, and June.

76. Aphnæus vulcanus.

Pap. vulcanus, Fabr. Syst. Ent. p. 519 (1775).
Poona, May.

77. Aphnæus schistaceus.

Aphnæus schistaceus, Moore, Lep. Ceylon, i. p. 106, pl. 41. figs. 3, 3*a*, ♂ ♀ (1881).
Sattara, September.

78. Aphnæus ictis.

A. ictis, Hewitson, Ill. D. L. p. 61, pl. 25. figs. 8, 9 (1865).
Poona, November to April.

79. Virachola perse.

D. perse, Hewitson, Ill. D. L. pl. 8. figs. 19, 20 (1863).
Kandalla, December; Bombay.

80. Virachola isocrates.

Hesperia isocrates, Fabr. Ent. Syst. iii. pt. 1, p. 266 (1793).
Poona, October to May; Khandalla, December; Bombay, July to December.

81. Deudorix epijarbas.

Dipsas epijarbas, Moore, Catal. Lep. Mus. E. I. C. i. p. 32 (1857).

Bombay, October.

82. Baspa melampus.

Pap. melampus, Cramer, Pap. Exot. iv. pl. 362. figs. G, H (1782).

Poona, November, December, and April; Belgaum; Bombay, October and November.

83. Tajuria longinus.

Hesperia longinus, Fabr. Ent. Syst. Suppl. p. 430 (1798).

Poona, November and December; Bombay, November.

84. Tajuria jehana.

Tajuria jehana, Moore, P. Z. S. 1883, p. 529, pl. 49. fig. 7.

Poona, March and December; Bombay, July and November.

85. Anops phædrus.

Pap. phædrus, Fabr. Spec. Ins. ii. p. 125 (1781).

Poona, November; Bombay, July, September, and October.

Papilionidæ.

Pierinæ.

86. Pontia xiphia.

Pap. xiphia, Fabr. Spec. Ins. ii. p. 43 (1781).

Poona, October to June; Matheran; Bombay, October, November, and December.

87. Terias læta.

T. læta, Boisd. Sp. Gén. i. p. 174 (1836).

Poona, October to June; Ahmednuggur, September, October, and November; Bombay, July, October, November, and December.

88. Terias drona.

Ter. drona, Horsf. Cat. Lep. E. I. C. p. 137, pl. 1. fig. 13 (1829).

Poona, November and December.

89. Terias venata.

Ter. venata, Moore, Cat. Lep. E. I. C. i. p. 65, pl. 2. fig. 2 (1857).

Poona, June and September; Ahmednuggur, June and September; Bombay, July to October.

90. Terias rubella.

Ter. rubella, Wall. Trans. Ent. Soc. ser. 3, vol. iv. p. 323 (1867).

Poona, October to April; Belgaum, September and October; Sattara, October and November; Bombay in 1877.

91. Terias hecabe.

Pap. hecabe, Linn. Mus. Ulr. p. 249 (1764).

Common everywhere, from November to May.

92. Terias hecabeoides.

Ter. hecabeoides, Mén. Cat. Mus. Petr., Lep. i. p. 85, pl. 2. fig. 2 (1855).

Common everywhere, from October to April.

93. Terias æsiope.

Ter. æsiope, Mén. Cat. Mus. Petr., Lep. i. p. 85, pl. 2. fig. 3 (1855).

Common everywhere, from October to April.

I took a male *T. hecabeoides* in coitu with a female of this species in September 1882.

94. Terias excavata.

Ter. excavata, Moore, P. Z. S. 1882, p. 252.

Poona, October and November; Sattara, October.

95. Terias purreea.

Ter. purreea, Moore, P. Z. S. 1882, p. 252.

Poona, November and January.

96. Terias irregularis.

Terias irregularis, Moore, P. Z. S. 1882, p. 253.

Poona, January.

97. Terias asphodelus.

Terias asphodelus, Butler, P. Z. S. 1883, p. 151, pl. 24. fig. 13.

Poona, January, February, March, and April.

98. Terias narcissus.

Ter. narcissus, Butler, P. Z. S. 1883, p. 151.

Poona, December.

99. Belenois mesentina.

Papilio mesentina, Cramer, Pap. Exot. iii. pl. 270. figs. A, B (1782).

Common everywhere.

100. Huphina phryne.

Papilio phryne, Fabr. Syst. Ent. p. 473 (1775).
Common everywhere.

101. Huphina zeuxippe.

Pap. zeuxippe, Cramer, Pap. Exot. iv. pl. 362. figs. E, F (1782).
Poona, April to June ; Belgaum.

Underside in both sexes like a faded *H. phryne*. Upper side like a male *H. phryne* without its vein-markings ; both sexes much more like each other than is the case with *H. phryne* : the female has the black border-markings darker than in the male, a spot near the hinder margin, and a black band all round the cell in the fore wings ; on the hind wings a submarginal row of spots, and the markings of the veins showing faintly through the wing.

102. Huphina cassida.

Pap. danaus cassida, Fabr. Ent. Syst. Suppl. p. 427, n. 595, 596 (1798).

Poona, October to April.

Below, the hind wings in both sexes are of a dull chrome-yellow colour, generally quite unmarked, sometimes with the subcostal and medial nervures greenish grey. Above, both sexes are very similar and resemble the male of *H. zeuxippe* ; but sometimes the hind wings of the males are quite immaculate, and the female has in the fore wing a diffused greyish band on the costa as far as the end of the cell, extending into and filling one third of the cell, going round the end of the cell and running partly up the third medial nervule, also a spot near the hinder margin, and on the hind wings a few faint submarginal spots, which, however, in many specimens are entirely absent.

103. Huphina pallida, n. sp.

Poona, January and February ; Bombay, February.

Allied to the former, but much smaller : ♂ ♀ pure white above, base with grey irrorations, which run up the costa of the fore wings to the end of the cell, and form a faint band filling one third of the cell ; apical border as in the preceding species, but more attenuated downwards. Hind wings immaculate, the usual macular band being altogether absent in most specimens, and very faintly indicated by spots in one or two of the veins in a few specimens.

Below, fore wing pure white, apex and the entire surface of hind wing pale yellowish fleshy-buff colour ; fore wings with the veins round the cell grey, a streak extending partly up the third medial nervule, a blackish spot between the second and third medial nervules, another near the hinder angle, between the submedian nervure and first median nervule. Hind wings unmarked.

The female only differs from the male in three extra marks on the upper surface of the fore wing, *i. e.* a streak from the end of the cell in the third median nervule, the spot at the end of this streak on the interspace between this and the second median nervule being much larger and more round, and by a spot near the hinder angle corresponding to the spot on the underside.

Expanse of wings, ♂ $1\frac{4}{10}$–$1\frac{6}{10}$ inch, ♀ $1\frac{5}{10}$–$1\frac{8}{10}$.

104. APPIAS LIBYTHEA.

Pap. libythea, Fabr. Syst. Ent. p. 471 (1775).

Poona, October to April; Bombay, July to December.

105. APPIAS ARES, n. sp.

Poona, November to March.

Allied to *A. libythea*, but smaller and altogether paler, and very different in the female.

♂. Above and below of the same white spotless colour as *A. libythea*, with the same kind of greyish irrorations on the costa above, but differing at the apex and outer border of the fore wings in being marked with only a few greyish-brown atoms, instead of the inwardly-toothed black border of *A. libythea*.

♀. Above white; fore wing with the costa finely grey, a streak at the end of the cell, a deep costal band on the basal half, filling the upper third of the cell, an apical band, commencing from the first subcostal nervule, and gradually fining down the outer border of the hinder angle, iron-grey; hind wings immaculate. Below white, apex of fore wings and the entire suface of hind wings slightly suffused with chrome-yellow, darkest in the basal portion of the costa of the hind wings; both wings quite unmarked.

Expanse of wings, ♂ $2\frac{1}{10}$ inches, ♀ $1\frac{9}{10}$.

106. HIPOSCRITIA SHIVA, n. sp. (Plate IX. figs. 1 ♂, 2 ♀.)

Parbutti Hill, Poona, December to April; very plentiful, but confined entirely to this hill.

Allied to *H. narendra*, Moore, but much smaller.

♂. Very much like a diminutive *H. narendra* above, but the hind wings are quite unmarked. Below, the fore wings have the black band limiting the apical patch much broader, and the hind wings are pale dirty bone-colour and quite unmarked.

♀. Has the apical patch like the female of *narendra* with the costa irrorated with the same colour, but without the broad costal band of that insect; the hind wings have a black macular border. Below, it is very similar to the male, with the subapical band broader, and the hind wings irrorated with grey and a black dot at the end of the cell.

Expanse of wings of *H. shiva*, $2\frac{1}{10}$ inches.

The female of *H. narendra*, which has never been described, has below a broad costal black band, a broad apical black patch with the apex suffused with chrome-yellow. Hind wings chrome-yellow, deeply irrorated with dark greenish grey.

Expanse of wings of *H. narendra*, $2\frac{8}{10}$ inches.

106 A. Delias eucharis.

Pap. eucharis, Drury, Ill. Exot. Ent. ii. pl. 10. figs. 5, 6 (1773).

Common everywhere all the year round. Larvæ feed on *Santalum album*, length $1\frac{1}{2}$ inch, colour greenish brown. Pupa pale yellow, spotted black, suspended by a thread round the body; they are much troubled by the Ichneumon, and of fifteen pupæ found on a gate-post at Poona, only one had escaped, the Ichneumon-larvæ being clearly visible through the skin of the pupa, there being from two to seven larvæ in each pupa.

107. Nepheronia gaea.

Nepheronia gaea, Felder, Reise Nov., Lep. ii. p. 130 (1865).

Poona, November to April; Bombay, October to November.

I have two female examples taken at Poona in November, with yellow on the abdominal border of the hind wings, above as in females of *N. happia*.

108. Nepheronia hippia.

Pap. hippia, Fabr. Mant. Ins. ii. p. 55 (1787).

Bombay, October, November, and December.

The male of this species has a much deeper black border to the hind wings than in the preceding species, and the female is altogether a darker insect, and has generally a good deal of chrome-yellow on the hind wings; at least this is the case with all the females of this species I have yet met with, whereas out of all the numerous examples of *N. gaea* I have taken (much the commoner species in the Deccan), I have only seen two with any yellow on them at all.

109. Catopsilia pyranthe.

Pap. pyranthe, Linn. Mus. Ulr. p. 245 (1764).

Common everywhere all the year round.

110. Catopsilia thisorella.

Callidryas thisorella, Boisd. Sp. Gén. i. p. 609 (1836).

Poona, November to June; Ahmednuggur, October to November.

111. Catopsilia ilea.

Pap. ilea, Fabr. Ent. Syst. Suppl. p. 426 (1798).

Poona, November to June; Ahmednuggur, September and October.

112. Catopsilia philippina.

Pap. philippina, Cram. Pap. Exot. iv. pl. 361. figs. C, D (1782).

Poona, October to April; Ahmednuggur, November; Bombay, March, July, and October.

113. Catopsilia crocale.

Pap. crocale, Cramer, Pap. Exot. i. pl. 55. figs. C, D (1779).

Poona, June and October; Ahmednuggur, June; Belgaum, September; Bombay, August to November.

Larvæ found feeding on Sumatran Acacia. Larval stage 20 days.

114. Catopsilia heera, n. sp.

Belgaum, September; Poona, November and December.

♂. Above like a small *C. crocale*; below also coloured like that species, but with a gilded dot at the end of the cell in all the wings, and sometimes with two gilded dots at the end of the cell on the hind wings.

♀. Above, coloured and marked like *C. crocale*; below in all respects like a pale female of *C. catilla*.

Expanse of wings, ♂ ♀ $2\frac{3}{10}$ inches.

This looks like a diminutive hybrid between *C. crocale* and *C. catilla*; but I have a long series from the same localities, all showing the same constant characteristics, and have gone through them with all the specimens of the genus in the British Museum, and am of opinion it is a good species.

115. Catopsilia catilla.

Pap. catilla, Cram. Pap. Exot. iii. pl. 229. figs. D, E (1782).

Common everywhere all the year round. Larvæ found feeding on Sumatran Acacia, length $1\frac{1}{2}$ to 2 inches, in the hot weather, and from $2\frac{1}{2}$ to 3 inches in the rains; larval stage 18 to 22 days.

116. Colias fieldii.

Col. fieldii, Mén. Cat. Mus. Petr., Lep. i. p. 79, pl. 1. fig. 5 (1855).

Bombay in 1877. I did not observe it in 1882 or 1883.

117. Hebomoia glaucippe.

Pap. glaucippe, Linn. Mus. Ulr. p. 240 (1764).

Khandalla Ghats, November and December.

It appears to be purely a mountain insect in these parts, and was never observed in the plains above or below.

118. Ixias meridionalis, n. sp. (Plate IX. fig. 5 ♀.)

Poona, June, October, and November; Ahmednuggur, October and November; Belgaum, September and October; Bombay, July to December.

Allied to *I. marianne*, Cramer, but altogether a brighter coloured insect.

♂. Above differs in the clearer white ground-colour of the wings, with the basal irrorations very thinly blue-grey, the inner black margin of the apical patch of the fore wings narrower, the black central knob squarer and cleaner cut, and the black band on hind wings narrower and not continued to the anal angle, but fining down and stopping before the first medial nervule, being produced to the angle in the shape of a bluish-grey shade which runs into the black border at the centre, giving the border an appearance of uniformity in depth throughout. Below, the coloration is very much brighter, more ochreous and altogether different; the apical orange patch is almost as large and as brilliant as it is above, and the discal series of spots on the hind wing are white, large, bordered with chocolate-brown, very much as in female *I. marianne* but larger.

♀. Differs from *I. marianne* of that sex above in having the inner border of the apical patch as in *I. agnivena* (Moore) and *I. dapalpura* (Butler), the broad streak from the costa terminating at the end of the cell. The border of the hind wings is narrow, exactly as in the male; and on the underside the markings are as in the male but larger, and the general coloration is very bright, brighter even than in *I. agnivena*, the fore wings being suffused with bright orange, and the hind wings with bright chrome-yellow.

Expanse of wings, ♂ ♀, $2\frac{3}{10}$ inches.

This species is no doubt the southern form of *I. marianne* (Cram.), but Cramer's plate is so badly coloured, the difficulty is in determining what Cramer's type of *I. marianne* really is. I have brought home many hundreds of examples of these white Ixias, and have gone through them all, and through the B. M. collection, and through Mr. Moore's splendid collection; and with Mr. Butler's assistance have come to the conclusion that Cramer's type represents the N.W. Indian form, of which I have several specimens from Mirzapore, and other places in N.W. India.

119. Ixias agnivena.

Ixias agnivena, Moore, Ann. & Mag. Nat. Hist. ser. 4, vol. xx. p. 50 (1877).

Poona, November to April.

120. Ixias cumballa, n. sp. (Plate IX. figs. 13 ♂, 14 ♀.)

Bombay, July and August.

Allied to *I. marianne* (Cramer).

♂. Above like a large *I. meridionalis*. Below, fore wings, above the first median nervule and the outer surface of the hind wings, bright sulphur-yellow. Fore wings with the entire space below the cell pure white, apical orange patch hardly visible through the wing, the discal spots deep black instead of brown; the entire surface of both wings with hardly any of the usual striations. Hind wings with the usual discal spots large, deep chocolate-brown, with a slight indication of white visible in one or two specimens, but generally of a bright chocolate-brown without any white at all.

♀. Above with a great deal of black, the inner border of the apical patch of the fore wings being so deep as to make the patch occupy more than half the wings; hind wings also with a very deep black border. It may here be noted that in all species of Indian Ixias the depth of the border of the hind wings and the depth of the inner border of the apical patch of the fore wings varies more or less. Below, the markings are as in the male, but the brown patch near the hinder angle is very much larger, and the discal series of large spots in the hind wings show more or less white in them; but the general coloration of the wings differs much from the males, the apical orange patch being almost as bright as it is above, and the general coloration of the wings is dull pale ochreous white covered with pale brown striæ.

Expanse of wings, ♂ ♀ $2\frac{5}{10}$ inches.

Taken on Cumballa Hill, Bombay, and I have an example also taken on a hill near Belgaum.

121. Ixias colaba, n. sp. (Plate IX. fig. 6.)

Bombay, 1876.

Allied to *I. pyrene* (Linn.).

♂. Above like *I. dharmsalæ*, Butler; the black basal irrorations are denser, the inner border of apical patch on the fore wings is narrower, the marginal border of the hind wings is deeper and not macular. Below, the general coloration is the same, but there are no striations, except a few very faint ones near the base and at the apex of the fore wings; there is a brownish spot at the end of the cell on the fore wings, also a faint spot on the costal third near the apex, a few very faint discal spots across the space occupied by the apical patch above, and a spot in the centre of the costa of the hind wings; otherwise both wings are clear lemon-yellow and quite unmarked.

Expanse of wings, $2\frac{5}{10}$ inches.

122. Ixias jhoda, n. sp. (Plate IX. figs. 3 ♂, 4 ♀.)

Bombay, December and January.

Allied to *I. pyrene* (Linn.), near *I. maulmainensis* (Moore), and *I. dharmsalæ* (Butler).

♂. Above like the latter, inner border of apical patch on primaries very narrow; hind wings with the border almost absent, reduced to spots on costal and subcostal nervules, and minute dots in the remaining nervules. Below, apical third of fore wings and the entire surface of hind wings deep chrome-yellow; remainder of fore wings pure primrose; the costa and apex of fore wings and the entire surface of hind wings covered with brown striæ; fore wings with a blind black spot at the end of the cell, and four, sometimes five, faint brown subapical spots; hind wing with a brown dot at the end of the cell, a large chocolate-brown spot in the centre of the costa, and four discal spots of the same colour, all with white pupils, the third discal spot the largest.

♀. Above pale primrose, with the markings somewhat as in

I. dharmsalæ of the same sex, but the inner border of the apical patch is composed of a broad band from the costa to the lower end of the cell, and then is connected with end of the patch near the hinder angle by a faint line, the orange space of the apical patch being in some examples pure yellow, and in some with a faint orange tinge; hind wings with the outer border as in the male. Below, with the markings as in the male, but the discal spots across the space occupied by the apical patch above are much larger and blacker; there are more of them, generally six, and the first three have white pupils; some of the specimens have a large blackish brown patch near the hinder angle, which is altogether absent in all the males; the discal spots in the hind wings are large, four in number, and are white on a suffused brown belt. Many of the females are pure albinos.

Expanse of wings, ♂ $2\frac{1}{10}$, ♀ 2 inches.

123. IXIAS DHARMSALÆ.

I. dharmsalæ, Butler, P. Z. S. 1880, p. 150, pl. xv. figs. 8, 9.

Bombay, September to December.

All the females captured are white. I have this species also from Deesa.

124. IXIAS KAUSALA.

I. kausala, Moore, Ann. & Mag. Nat. Hist. ser. 4, vol. xx. p. 49 (1877).

Bombay, taken in 1877.

125. TERACOLUS FULVIA.

Idmais fulvia, Wallace, Trans. Ent. Soc. ser. 3, vol. iv. p. 392, pl. 9. fig. 5 (1867).

Poona, October.

126. TERACOLUS CYPRÆA.

Pap. cypræa, Fabr. Mant. Ins. p. 22 (1787).

Bombay, taken in 1877.

127. TERACOLUS KENNEDII.

T. kennedii, C. Swinhoe, P. Z. S. 1884, p. 440.

Ahmednuggur, August, September, and October. Very plentiful, and apparently quite a local insect.

128. TERACOLUS DANAË.

Pap. danaë, Fabr. Syst. Ent. p. 476 (1775).

Bombay, Poona, and Belgaum.

I took it in Bombay in 1877, but did not succeed in getting it through my own collector during the past two years, and therefore no date is recorded; but I received examples from both Poona and

Belgaum from friends in 1883. It is always a rare insect in the Deccan.

129. TERACOLUS TAPLINI.

T. taplini, C. Swinhoe, P. Z. S. 1884, p. 440, pl. 40. figs. 8, 9.

Bombay, in coll. B. M.; Poona, May.

I took two examples in Bombay in 1877, a coloured drawing of one of which I still have; and Mr. Taplin sent me one captured last May, from Poona.

130. TERACOLUS PERNOTATUS.

T. pernotatus, Butler, P. Z. S. 1876, p. 159, pl. 7. fig. 1.

Poona, October and November.

131. TERACOLUS ETRIDA.

Anthocharis etrida, Boisd. Sp. Gén. i. p. 576 (1836).

Poona, November, January, February, and June; Ahmednuggur, November; Bombay, September.

132. TERACOLUS BIMBURA.

T. bimbura, Butler, P. Z. S. 1876, p. 161, pl. 7. figs. 3–4.

Poona, October and January.

Butler's type came from Bimbur in Cashmir; but the underside of the secondaries has such extraordinary markings, and is so different from anything else in the genus, there is no mistaking the insect.

133. TERACOLUS PSEUDEVANTHE.

T. pseudevanthe, Butler, P. Z. S. 1876, p. 164, pl. 7. fig. 16.

Belgaum, September; Bombay, July and August, November and December.

134. TERACOLUS EUCHARIS.

Pap. eucharis, Fabr. Syst. Nat. p. 472 (1775).

Bombay, February; very plentiful.

135. TERACOLUS TITEA.

Pieris titea, Godt. Ent. Méth. ix. p. 124 (1819).

Bombay, December; very plentiful.

The above three are very closely allied to each other. They are probably seasonal varieties of each other, but with a very long series I have been able to separate them without leaving any intermediates.

PAPILIONINÆ.

136. ILIADES POLYMNESTOR.

Pap. polymnestor, Cram. Pap. Exot. i. pl. 53. figs. A, B (1779).

Matheran; Parbutti hill, Poona, November; would probably be found on the sides of most of the larger mountains in the district.

137. Opheides erithonius.

Pap. erithonius, Cram. Pap. Exot. iii. pl. 232. figs. A, B (1782).

Common everywhere throughout the year. Larvæ feed on citron, lime, and orange. At Poona Mr. Taplin has reared them all the year round; both dark and pale yellow forms. Larval stage 14 days; pupal stage 14 days.

138. Chilasa dissimilis.

Pap. dissimilis, Linn. Mus. Ulr. p. 301 (1764).

Khandalla, December; affects the hill-sides; Bombay, taken in 1877.

139. Chilasa clytia.

Pap. clytia, Linn. Mus. Ulr. p. 296 (1764).

Bombay, taken in 1877.

140. Laertias pammon.

Pap. pammon, Linn. Mus. Ulr. p. 189 (1764).
Pap. polytes, Linn.

Common everywhere throughout the year; the females of both *P. hector* and *P. diphilus* form. The larva and pupa are very similar in appearance to those of *P. erithonius*. The larvæ feed on citron, lime, and orange. Larval stage 14 days; pupal stage 14 days. The pupa is sometimes bright green and sometimes chocolate-brown. Both kinds are equally common, and each produces both sexes.

141. Menelaides diphilus.

Pap. diphilus, Esper, Ausl. Schmett. pl. 40 B. fig. 1 (1785–98).

Common everywhere from October till June. It varies much in size and markings; some of the males taken in the cold weather at Ahmednuggur are very small, measuring less than 3 inches in the expanse of their wings.

142. Menelaides hector.

Pap. hector, Linn. Mus. Ulr. p. 183 (1764).

Poona, March and June; Belgaum, October; Bombay, July, September, and October.

143. Charus helenus.

Pap. helenus, Linn. Mus. Ulr. p. 185 (1764).

Poona.

144. Zethes agamemnon.

Pap. agamemnon, Linn. Mus. Ulr. p. 202 (1764).

Poona, Belgaum, Ahmednuggur, October to June; Bombay, all the year round. Larvæ feed on *Gnaltherea longifolia*, colour dark green with yellowish shades; more humpbacked than the larvæ of *P. pammon*, with sharp spines on the shoulders. Larval stage 18 to 21 days; pupal stage the same.

145. DELCHINA THERMODUSA, n. sp.

Matheran, November and December.

Allied to *D. teredon*, Felder, and *D. sarpedon*, Linn. The green band across the middle of the wings is much broader in the centre, touching the discoidal cell at the first median nervule, and fining upwards and downwards quite suddenly; the band on the fore wing being also composed of eight pieces instead of nine, as in the other two species, the first apical spot being absent. Hind wing with the tail produced as in *D. teredon*.

Underside differs from both on the hind wing in the very narrow subbasal black latitudinal streak margining the green band, in the absence of the black suffusion in the costal and subcostal interspaces, and in the black and red space at the end of the cell being very limited and pushed out by the green band, and in the general coloration of both wings being very much paler. These characteristics are identical in the four specimens in my collection.

Expanse of wings $3\frac{5}{10}$ inches. In coll. C. Swinhoe.

HESPERIIDÆ.

146. SARANGESA PURENDRA.

Pyrgus purendra, Moore, Cat. Lep. Mus. E. I. C. i. p. 250.

Bombay, August to December.

147. PYRGUS GALBA.

Hesperia galba, Fabr. Ent. Syst. iii. 1, p. 352 (1793).

Poona, January and March; Bombay, August.

148. AMPITTIA CORAS.

Pap. coras, Cram. Pap. Exot. i. pl. 31. fig. F (1775).

Bombay, July to October.

149. ASTICTOPTERUS STELLIFER, Butler.

Astictopterus stellifer, Butler, Trans. Linn. Soc. 1879, p. 555.

Poona, April; Bombay, November.

150. UDASPES FOLUS.

Pap. folus, Cram. Pap. Exot. iv. pl. 354. fig. H (1782).

Poona, Ahmednuggur, Bombay.

I have received it at different times from all these places, but never succeeded in capturing one myself, and consequently no date is recorded.

151. PLESIONEURA LEUCOCERA.

Hesperia leucocera, Kollar, Hugel's Kasch. iv. 2, p. 454, pl. 18. fig. 3.

Bombay, September.

152. PLESIONEURA AMBAREESA.

P. ambareesa, Moore, P. Z. S. 1865, p. 788.

Mahableshwur, May.

153. Telicota augias.

Pap. augias, Linn. Syst. Nat. i. 2, p. 794 (1767).

Poona, September to June; very common.

154. Parnara bada.

Hesperia bada, Moore, P. Z. S. 1878, p. 688.

Poona, October, November, and December; Belgaum, September; Bombay, September.

155. Parnara bevani.

Hesperia bevani, Moore, P. Z. S. 1878, p. 688.

Poona, October, November, and December; Bombay, September, January.

156. Parnara narooa.

Hesperia narooa, Moore, P. Z. S. 1878, p. 687, pl. 45. fig. 4.

Poona, November and December.

157. Chapra agna.

Hesperia agna, Moore, P. Z. S. 1865, p. 791.

Poona, September, October, and November; Belgaum, September; Bombay, September.

158. Chapra mathias.

Hesperia mathias, Fabr. Ent. Syst. Suppl. p. 433 (1798).

Poona, October to May; Ahmednuggur, November; Bombay, July to December.

159. Suastus gremius.

Hesperia gremius, Fabr., Butler, Cat. Fabr. Lep. B. M. p. 271, pl. 3. fig. 7, ♀.

Hesperia divodasa, Moore, Cat. Lep. Mus. E. I. C. i. p. 255.

Poona, February and May; Bombay, July to December.

160. Isoteinon nilgiriana.

Isoteinon nilgiriana, Moore, P. Z. S. 1883, p. 533.

Matheran, May.

161. Isoteinon flexilis, n. sp. (Plate IX. figs. 9, 10.)

Poona, December.

♂ ♀. Upper side dark shining olive-brown; cilia pure white; fore wing with two small semidiaphanous spots, one at the upper end of cell and one above it; three contiguous subapical spots, the top spot very minute and in the male sometimes absent; another outer very minute dot, which also is often absent in the male; and three larger spots obliquely—two in the disk and one touching the submedian nervure; hind wings unmarked. Underside paler, spots as above;

fore wings with a blackish longitudinal shade covering the lower half of the wing; hind wings with an indistinct diffused discal fascia of same colour.

Expanse of wings $1\frac{5}{10}$ inch.

162. Badamia exclamationis.

Pap. exclamationis, Fabr. Syst. Ent. p. 530 (1775).

♀ *Pap. ladon*, Cramer, Pap. Exot. iii. pl. 284. fig. C (1782).

Poona, April, May, and June; Belgaum, September; Mahableshwur, May; Matheran, May; Bombay, July, August, September.

163. Parata alexis.

Pap. alexis, Fabr. Syst. Ent. p. 533 (1775).

Poona, May, June, November, December; Bombay, July, August, and September.

164. Gangara thyrsis.

Pap. thyrsis, Fabr. Syst. Ent. p. 532 (1775).

Bombay, August to December. Very common just before dark.

EXPLANATION OF PLATE IX.

Fig. 1. *Hiposcritia shiva*, ♂, n. sp., p. 138.
2. —— ——, ♀.
3. *Ixias jhoda*, ♂, n. sp., p. 142.
4. —— ——, ♀.
5. —— *meridionalis*, ♀, n. sp., p. 140.
6. —— *colaba*, ♂, n. sp., p. 141.
7. *Megisba gunga*, n. sp., p. 133.
8. *Catochrysops theseus*, ♂, n. sp., p. 131.
9. *Isoteinon flexilis* (upper side), n. sp., p. 147.
10. —— —— (underside).
11. *Zizera ossa*, ♂, n. sp., p. 132.
12. —— ——, ♀.
13. *Ixias cumballa*, ♂, n. sp., p. 141.
14. —— ——, ♀.

3. On *Echidna acanthion* from Northern Queensland. By Robert Collett, C.M.Z.S.

[Received January 13, 1885.]

(Plate X.)

We have in the course of late years several times been informed that the genus *Echidna* extends into Queensland. But although a considerable number of specimens have been obtained from that part of Australia, and several of them have found their way to Europe, still no satisfactory examination of their specific characters as compared with those of the other species has, so far as I know, ever been published.

Thus in Dr. Bennett's interesting paper on *Ornithorhynchus* and their burrows (Proc. Zool. Soc. Lond. 1877, p. 161) it is mentioned that the *Echidna* is very numerous in the Gomarry scrubs, Merugaden;

Smit lith. Hanhart imp.

ECHIDNA ACANTHION.

and in a later article (1881, p. 737) a similar statement is made as regards the district of Toowoomba, not far from Brisbane ($27\frac{1}{2}°$ S. lat.) by Mr. George Bennett, his son. Moreover, Mr. Macleay says in an article in Proc. Linn. Soc. New South Wales, 1884, vol. viii. p. 425, that he has had the *Echidna* in confinement from the district of Brisbane. Thus it is evident that the *Echidna* is a well-known animal in that part of Queensland.

In all these papers the said species is entered under the name of *E. hystrix*, i. e. *aculeata*, and, moreover, as several of the specimens collected have been examined in London by Prof. Owen and others, there seems no reason to doubt that they really belong to this well-known South-Australian species.

In June 1878, again, Capt. Armit mentions in the Journ. Linn. Soc. New South Wales, vol. xiv. p. 411, that North Queensland is also inhabited by the *Echidna*, which he found numerous at Georgetown, 200 miles west of Cardwell, and he states that it is met with at least up to 18° S. lat., and according to his opinion also will be found on the Leichhardt ranges and throughout the length and breadth of the Cape-York peninsula.

Capt. Armit gives us no definite information as to the species to which he refers the *Echidna* of the Cardwell district, nor does he furnish any description of it. But he sent to the Linnean Society in London a dried skull to which, according to Dr. Murie, the following label was attached :—" Head of *Tachyglossus* (*hystrix*?), ♀, killed near Georgetown in 18° S. lat. Nov. 1876."

This skull has been examined by Dr. Murie and described in the Journ. Linn. Soc. vol. xiv. p. 413, where he concludes his researches with the following words :—" In conclusion I would state that, from the data which have come under my observation, we cannot regard Capt. Armit's animal found in Queensland as offering any distinction from the wide-spread *Echidna hystrix*."

As mentioned before, there seems to be no reason to doubt that the *Echidna* that occurs in the district of Brisbane really belongs to *E. aculeata*, which thus extends from the most southern part of Australia at least as far north as the $27\frac{1}{2}°$ S. lat. in South Queensland.

On the other hand, it is highly improbable that Capt. Armit's specimens from North Queensland could have been identical with the said species, although Dr. Murie has with the greatest accuracy compared the skull mentioned above with five skulls of the species from South Australia and Tasmania, without being able to find any specific distinction between them. It will be shown by the following that Dr. Murie has given at least one brief character (without attributing much importance to it, on account of the insufficient materials), which has, however, proved to be constant for the species :—"The female Queensland skull . . . . is barely appreciably narrower across the cerebral area, but decidedly lower in the same region."

Amongst the interesting collection of mammals brought home to the Museum of the University of Christiania by Dr. Lumholtz from Central and North Queensland in the years 1881–84[1], there were nine specimens of the North-Queensland *Echidna*, all of them collected in the district west of Rockhampton, under 23° S. lat.

I shall endeavour now to give some remarks on these specimens. In my opinion there can be no doubt of their being different from *E. aculeata*; and as they also seem to differ from *E. lawesi*, Rams., from New Guinea, described in March 1877 (Proc. Linn. Soc. New South Wales, vol. ii. p. 30), a species still only imperfectly known, but to which they are, at any rate, very nearly related, I have thought it best to give the North Queensland *Echidna* a special name; and at the last meeting of the Scientific Society of Christiania (Dec. 14, 1884), I communicated its diagnosis and a brief description of it under the name of *E. acanthion*.

ECHIDNA ACANTHION, Coll. 1884.

Tachyglossus, sp. inc., Armit, Journ. Linn. Soc. vol. xiv. (Zoology), p. 411 (Cardwell district), 1878.

Echidna hystrix, Murie, Journ. Linn. Soc. vol. xiv. (Zoology), p. 413 (Cardwell district), 1878.

Tachyglossus lawesi, Ltk. Proc. Zool. Soc. Lond. 1884, p. 150 (unknown locality).

Echidna acanthion, Collett, Forh. Vid. Selsk. Christ. 1884, no. 13, pp. 1–12 (Rockhampton district), 1884.

Diagn. Snout of moderate length, or rather short, slightly bent upwards, and to the length of the skull as 1 to $2–2\frac{1}{4}$.

The skull, which is to the total length as 1 to about 4, is broadest below, and more or less narrower towards the *parietalia*. The breadth is to the length of the skull as 1 to 2·5.

The dorsal spines are powerful and closely set, of unequal size; whitish yellow with black tips; some, which are longer than the others, form irregular rows along the back, the rest being shorter, with the black tip broader; they begin midway between eye and ear, and extend on the sides a little beyond the margin of the belly. Flattish bristles, intermingled with hairs, cover the front, the fore feet, and the belly. Breast and throat covered with hairs. The hairs on the back very short and scarce.

The soft parts of the body brownish black, sometimes with a clearer tint on the fore limbs; in a young male the throat was yellowish brown.

The second claw on the hind foot is very long, the third short and slender, being scarcely half the length of the second.

Total length about 450 millim.

Locality. Dr. Lumholtz informs me that he found this species fairly well distributed over the eastern part of Central Queensland. In the coast-range near Herbert river in North Queensland (18° S. lat.) it was also common; it occurs here in the ranges covered with dense scrubs. It is called "Gombian" by the natives, and is tracked by the tamed dingoes, and it is considered here, as everywhere else, a great delicacy by reason of its fatness.

[1] *Vide* Proc. Zool. Soc. 1884, p. 381 (and p. 406).

E. acanthion is no doubt distributed over the whole of Central Queensland, at least in the eastern parts of that district, and in North Queensland as far up as to 18° S. lat.; but it also occurs, according to Capt. Armit's supposition, over the whole of Cape York peninsula.

Thus the remarkable genus *Echidna* extends from Tasmania (*E. setosa*, Cuv.), throughout the whole eastern part of Australia, from Victoria and New South Wales to South Queensland, occurring also in West Australia (*E. aculeata*, Shaw), and through Central and North Queensland up to Torres Strait (*E. acanthion*); furthermore it occurs in the south-eastern part of New Guinea (*E. lawesi*, Rams.). Besides these, the northern parts of New Guinea is inhabited by a fifth species, the rather aberrant form *Proechidna bruijni* (Peters and Doria)[1]. *E. acanthion* is much nearer related to the *E. lawesi* from New Guinea, than it is to the South-Australian *E. aculeata*.

Specimens examined.—The specimens collected by Dr. Lumholtz, and preserved in the University Museum of Christiania, are the following[2]:—

		Total length.	
1.	♂ jun.	365	millim.
2.	♀	425	,,
3.	♂	448	,,
4.	?	420	,,
5.	♂	415	,,
6.	♀	443	,,
7.	♀	about 410	,,
8.	♀	about 405	,,
9.	♀	448	,,

No. 1 is a young male, caught at Gracemere near Rockhampton in July 1881. The others were caught at Coomooboolaroo, 80 miles W. of Rockhampton; Nos. 2-8 in February 1884; No. 9, a female with fully developed mammæ, in the beginning of March the same year.

Sex. Of the nine specimens, three are males, five females; in one specimen (No. 4) of which the skeleton only is preserved, the sex cannot with certainty be decided, but it would seem to have been a female.

I cannot detect any character by which the sexes can be distinguished externally, with the exception of the sharp, but short spur on the inside of the hind heel of the male; this spur has already appeared in the young male (No. 1), the skeleton of which is far from being perfectly ossified.

As to the skull it may be noted that the male (No. 5) has a proportionally shorter snout than the female (No. 9), but its skull is, on the other hand, broader and higher behind (*cf.* figs. 3 & 4,

[1] *Tachyglossus bruijnii*, Peters and Doria, 1876; *Acanthoglossus bruijnii*, P. Gervais, 1877; *Proechidna bruijnii*, Murie, 1878; and *Bruijnia tridactyla*, Dubois, 1872.

[2] At present there are stuffed specimens of the following:—No. 1, No. 5, and No. 9; and mounted skeletons of No. 1, No. 2, and No. 3.

p. 155). How far this fact is the rule, or whether it is attributable to the younger age of the male, can only be ascertained on the examination of more abundant materials.

Size.—The largest specimens are a male and a female with a total length of 448 millim. each, and these appear to be full-grown. The second male (No. 5) is younger, with a total length of 415 millim., and the skeleton showed that it was not yet full-grown. The third male (No. 1) was young. The females have a total length of 405 to about 440 millim.

The greater number of the specimens have thus a length of more than 16, but not quite 18 inches, which may perhaps be considered to be the normal size, as the generative organs of one of the females, which have been preserved, showed the specimen to be fully developed.

It is, however, probable that *E. acanthion* attains a still larger size, as it can be seen by comparison of two skeletons of the same size of *E. acanthion* and *E. aculeata* (total length 425 mm.) that the last species is already in every respect fully ossified without a trace of the open sutures, while in *E. acanthion*, on the other hand, there are still some traces of these earlier stages. It may therefore be concluded, that perhaps the North-Queensland species attains still larger dimensions than *E. aculeata* [1].

The Covering of the Skin.—The dorsal spines are long and powerful, closely placed, and perfectly hiding the scarce and short fur at their bases. A number of spines are stronger than the others, and are regularly distributed over the back, making it almost possible to arrange them here in three to four irregular series; they are also distinguishable from the others by the clearer colour of their exposed parts. These strong spines reach a length on the back of 43–47 millim., on the tail sometimes of 55 millim.; their diameter is $3\frac{1}{2}$ millim.

The other spines, which are far the greatest in number, are shorter and finer, have a length of about 22–30 millim., sometimes a little more, but are distinguishable by their darker colours. Their diameter rarely exceeds 2–$2\frac{1}{2}$ millim.

This spiny covering extends forward to beyond the ear, on the sides of the body as far as to the margin of the belly; one or two spines may sometimes reach beyond the margin, but the rule is that the belly is only covered with hairs.

The fur at the root of the spines is, as mentioned above, very scarce and short, and it is only a rare exception that the tips of one or two hairs are visible between the spines, as in the young male (No. 1). The forehead and throat are covered with flattish bristles, mingled with a few normal hairs, which commence in front of the eye; these bristles gradually merge behind into short spines, which successively become stronger; still on the occiput and the nape they are somewhat shorter than those on the back. The legs are covered with similar flattish bristles, particularly on their outer

[1] Of this latter species there is preserved in the University Museum of Christiania a mounted specimen with a total length of about 470 to 480 millim.

side, yet here mixed with normal hairs. At the hind margin of the ear is found a thick patch of blackish hairs, as in the other species. The belly is covered with hairs, longer or shorter, mixed with flattish bristles; on the breast and lower side of the head there are, as a rule, no bristles, but hairs only.

Colour.—The dorsal spines are pale yellowish with black tips; this black tip is very short in the longer spines, but broader in the shorter ones, by which the longer get a clearer appearance than the rest. In some specimens (but not in all) one or two of these spines are entirely yellowish without black tips. In the shorter spines the pale colour at their bases is almost hidden by the black. Thus, contrary to *E. aculeata*, where all spines are equally coloured (yellowish with short black tips), and almost of the same length, *E. acanthion* at a distance appears to be blackish with irregular series of long and clearer-coloured spines. On the nape and the front the spines are sometimes entirely black, sometimes yellowish, or particoloured.

One of the specimens (No. 9) differs a little from the rest, the longer spines here being almost black, like the shorter. This specimen, a full-grown female, therefore appears to be blackish with a few yellowish spots.

The colour of the belly is blackish brown, under the tail perfectly black; in some specimens a paler line may be observed on the outer side of the legs.

The young male (No. 1) is somewhat different from the rest, the breast and throat being reddish brown, which colour also extends itself along the inner side of the fore limbs, and can be traced also on the hind limbs. An irregular black band crosses the throat from the lower side of the ears. The belly is blackish brown, as in the other specimens, and mixed with one or two yellowish spines.

Skeleton.—In the young male, with a total length of 365 millim., the skeleton is very far from being perfectly ossified. A large fontanelle is found on the upper part of the *os temporale*; in many of the bones the different epiphyses are not yet grown together. There are open sutures between the occipitals, and between the *costæ cervicales* and their vertebræ; the *caput femoris* is separate; the sacral vertebræ are all separate, as well as the bones of the pelvis. On the dorsal vertebræ the spinous processes are very cartilaginous; the same is the case with the upper margin of the *scapula*, of the *proc. olecranoides* in the *fibula*, and at the ends of other bones. The *os coracoideum* is separate. On the lower jaw the *proc. coronoideus ext.* is still not developed.

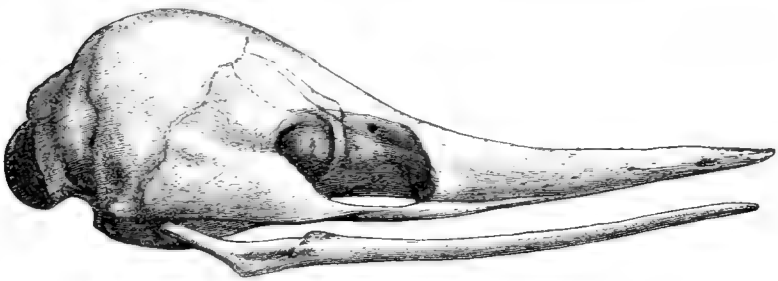
In an apparently almost full-grown female, with a total length of 425 millim., the sutures are still open around the *os basioccipitale*, and the *costæ cervic.* of the *epistrophæus* can still be separated when slightly pressed, and the epiphyses both on the *ulna* and *radius* and on the *fibula* and *tibia* may be easily parted [1].

[1] As mentioned above, all these parts are perfectly ossified in a specimen of *E. aculeata* of the same size.

In a male specimen, with a total length of 448 millim., the skeleton is perfectly ossified.

The skull is very much like that of *E. aculeata*, but may probably always be distinguished by its narrower cerebral area and propor-

Fig. 1.

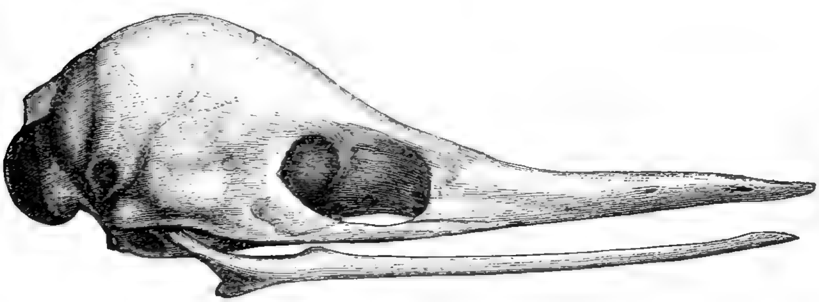


Skull of *Echidna acanthion*, ♂. No. 5.

tionally short snout, although scarcely different in this respect from the South-Australian and Tasmanian species. The length of the skull in proportion to the total length of the skeleton is as 1 to 4 (3·93 to 4·26).

When the skull is seen from behind, the lateral profile, especially in the somewhat younger specimens, widens regularly downwards, the *os squamosum* having its greatest height below, and the upper part of *os temporale* (*perioticum*) diminishes regularly towards the *parietalia*. The greatest breadth, which is to the length as 1 to 2·5,

Fig. 2.



Skull of *Echidna acanthion*, ♀. No. 9.

is therefore in *E. acanthion* situated at the bottom of the skull, quite near the glenoid fossa.

In the perfectly full-grown specimens (male and female) the skull becomes less narrow upwards, but in all cases does not widen as in

E. aculeata. In these specimens the *crista sagittalis* is also sharp and longer, whereas only a trace of it may be observed in the younger skulls.

The snout is of moderate length or rather short. In the full-grown specimen its proportion to the length of the skull is as 1 to $2\frac{1}{4}$, as will be seen by the list below, and in several specimens it is but a little longer than the breadth of the skull[1].

Measurements.

	Sex.	Total length.	Length of skull.	Length of snout.	Breadth of skull.	Proportion of snout to the skull.
		millim.	millim.	millim.	millim.	
2.	♀ ...	425	108	51	43	2·11
3.	♂ ...	448	105	47	44	2·23
4.	...	420	103	46	43	2·23
5.	♂ ...	415	104	46	42	2·26
6.	♀ ...	443	110	52	45	2·11
7.	♀ ...	(c) 410	103	47	42	(c) 2·19
8.	♀ ...	(c) 405	101	46	40	(c) 2·19
9.	♀ ...	448	111	53	44	2·09

In the full-grown specimens the snout is more or less distinctly turned upwards, the profile of the front being deeply concave over the orbits, and down along the *nasalia*, and the lower margin of the skull rises obliquely in front of the orbits. Thus the skull forms a distinct contrast to that of *Proechidna bruijni* from New Guinea;

Fig. 3.

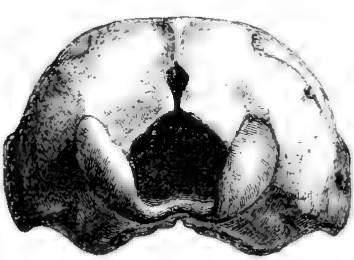


Fig. 4.

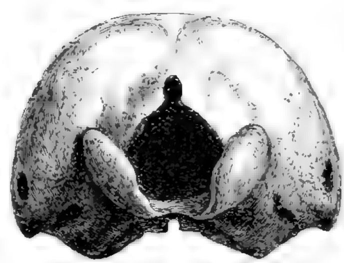


Fig. 3. Skull of *Echidna acanthion*, ♀ (back view). No. 9.
Fig. 4. Skull of *Echidna acanthion*, ♂ (back view). No. 5.

probably the other Papuan species, *E. lawesi*, has a similar concave snout to *E. acanthion*. The palate is armed with about nine rows

[1] The snout is measured without the cutaneous covering, from the *foramen lacrymale* in the skeleton, or the foremost margin of the eye in the skin.

of retroverted spines, the number of which varies in the different specimens; as a rule the hinder and middlemost rows, which are the longest, have 15 to 20 of these spines. They are very short and sharp.

In the young male (No. 8) the skull is not yet full-grown; the snout is remarkably short, even shorter than the breadth of the skull[1]. The snout is not bent up, but perfectly straight, the profile of the frontals not being concave over the orbits; but a faint concavity can be traced beyond the middle of the *nasalia*.

The snout is proportionally broad in this specimen; the breadth of the *ossa nasalia* on their frontal end measuring together 16 millim.; in the full-grown specimen the breadth is about 10–11 millim.

Vertebræ.—The number of vertebræ was as follows:—cervical vertebræ 7, dorsal vertebræ 16, lumbar vertebræ 3, sacral vertebræ 3, caudal vertebræ 13–14 (where the latter have been complete). In two specimens, a female with a total length of 425 millim. (No. 2), and a male with a total length of 448 millim. (No. 3), the last dorsal vertebra had no trace of ribs, and thus there were 15 dorsal and 4 lumbar vertebræ. All the vertebræ were more slender than in specimens of *E. aculeata* of the same size.

The Limbs.—The exact measurements of the bones of fore and hind limbs are as follows:—

	No. 5, ♂. Total length 415 millim.	No. 4. Total length 420 millim.	No. 2, ♀. Total length 425 millim.	No. 3, ♂. Total length 448 millim.	No. 9, ♀. Total length 448 millim.
	millim.	millim.	millim.	millim.	millim.
Humerus[2]	42	42	45	42	46
Ulna ...	62	62	67	67	67
Radius ...	48	48	50	52	53
Femur ...	54	52	57	55	57
Tibia ...	51	52	56	55	57
Fibula ...	57	59	62	62	60

The *ossa marsupialia* have about the same length as the humerus.

The claws are no doubt of precisely the same construction as in the Papuan *E. lawesi*. The second claw is very long, strong, and curved, with a length of 35–36 millim., or even 38 millim., whereas the third claw is much slenderer and is scarcely half the size of the second; its length is 15–16 millim., and it is but a little longer than the fourth and fifth, which are the shortest.

[1] Length of the skeleton 365 millim.; length of the skull 93 millim.; of the snout 41 millim.; breadth of the skull 43 millim.; proportion of the snout to the skull 2·02.

[2] Measured from the articulations.

The Ovaries and Mammæ.—In the paper of Mr. George Bennett previously alluded to (Proc. Zool. Soc. Lond. 1881, p. 737) it is stated that he found impregnated specimens of the South-Queensland species (*E. aculeata*) on the 30th August and the 14th September, and that, according to his view, the young will be found in the uterus in the course of September or October in this part of Queensland (the Brisbane district), although he acknowledges that he does not "think it can be fixed at any certain period, but must in some places begin earlier than in others."

The specimens from Central Queensland collected by Dr. Lumholtz were caught in February or March (with exception of the young male, which was caught in July), and thus the generative organs may be presumed to have been in a dormant state. This, however, seems not to have been the case; and it is probable that *E. acanthion* produces its young at a different (earlier) season from the southern *E. aculeata.*

Dr. Lumholtz informs me that, according to the statements of both the white men and the natives, *E. acanthion* breeds in the winter time, as a rule in the month of May. One pair of ovaries and one pair of mammæ were preserved and brought home by him. The first were taken from a full-grown specimen (No. 9) in the beginning of March, and are considerably developed, although not containing at the time mature eggs. The mammary glands, which were, as far as Dr. L. remembers, taken from the same specimen, were on the other hand large and swollen and contained quantities of milk which profusely flowed out on a slight pressure.

The two ovaries were of about the same size, the right, however, being a trifle smaller. Both were equally developed and showed on their upper surface a number of ovisacs which appeared as shining hemispheres in the stroma without being stretched in any pedicle. The number of these ovisacs was in the right ovary six, all of about the same size with a diameter of $3\frac{1}{2}$ millim., besides four to five smaller or very small. On the left there were 13 larger ovisacs, with a diameter of 4 millim., and two to three smaller ones.

The two *uteri* were about equally developed on both sides, but here also the left was a trifle larger. Both were at the time strongly contracted and empty; the diameter from the outer walls was 7 millim. On the right uterus the *peritoneum* with *tunica propria* was straitened a little above the middle, so that the upper part appeared as a rather twisted enlargement (8 millim.). The inner layer of the uterine wall had a thickness of $3\frac{1}{2}$ millim.

The length of the right *uterus* was 24 millim., of the left 29 millim.

The common *vestibulum* was very wide, and filled with crushed parts of insects.

The *vesica urinaria* was very muscular.

As mentioned above, the two mammary glands contained quantities of milk and appeared to have been in full action. They were oblong or kidney-formed and rather compressed; they were shaped as if folded together a little above the middle, and covered with a thin membranous tissue. One (the left?) was the larger, and had a length of about 57 millim., a breadth of 40 millim.; its greatest thickness (at the outlet of the lacteal ducts) was 22 millim. The other was a little smaller.

The "mammary areola" was visible on the belly as a flattish spot. No trace of a pouch could with certainty be distinguished (in the single mounted female specimen).

In the mounted full-grown male was visible on each side of the belly (where the mammary areola is found in the female) a small vortex of hairs, apparently an indication of the rudimentary *mammæ* of the males of other mammals.

Parasites.—In two specimens I found half a dozen individuals of an *Ixodes*, attached between the hairs at the root of the dorsal spines or in the ear-tuft.

Comparison with E. aculeata.—Whilst *E. acanthion* will be easily distinguishable from *E. aculeata* by its external characters, the skeletons of both species are more difficult to distinguish. Yet, compared with a skeleton of *E. aculeata* of the same size, that of *E. acanthion* will be seen to be decidedly slenderer.

Thus when the skeleton No. 3, with a total length of 448 millim., is laid side by side with a skeleton of *E. aculeata*, the total length of which is 450 millim., all the vertebræ from the head to the pelvis show themselves as perceptibly narrower and weaker; whilst the breadth of the penultimate lumbar vertebra in *E. aculeata* was 20 millim., the same vertebra in *E. acanthion* was only $16\frac{1}{2}$ millim. broad.

The *processus spinosi* of the first dorsal vertebra did not (yet) show any trace of being notched in *E. acanthion*, whilst the notches were distinct in the other species.

The *humerus* is weaker and narrower. The breadth between *epicondylus medialis* and *lateralis* (*i. e.* the greatest breadth on the ulnar side) is in *E. aculeata* 47 millim., in *E. acanthion* 41 millim. only; the breadth between *trochanter medialis* and *lateralis* (*i. e.* the greatest breadth on the scapular side) is 31 millim. in *E. aculeata*, and 27 millim. in *E. acanthion.*

The *scapula* is shorter and is more straight. Its greatest length (to the articulation with *humerus*) in *E. aculeata* is 56 millim., in *E. acanthion* 51 millim.; in the latter species the *margo superior* is almost straight, but more bent outwards in *E. aculeata*.

The *ribs* are not narrower in *E. acanthion* than in the other species; but the *pelvis* is decidedly weaker. Whilst thus the length from the upper end of *os ilii* to the hinder end of *os ischii* (*i. e.* the greatest length of the pelvis) in *E. aculeata* was 66 millim., the same distance in *E. acanthion* was 60 millim. only; and whilst the greatest breadth (between the upper ends of *ossa ilii*) in *E. aculeata* was 44 millim., the same in *E. acanthion* is 41 millim. Also the *foramen obturatorium* was the larger in *E. aculeata*.

The *femur* is shorter; in *E. aculeata* its length is 59 millim., in *E. acanthion* 53 millim. Any difference in the length of the other bones of the limbs can scarcely be shown to exist, but all are perceptibly stronger in *E. aculeata*.

As mentioned above, *E. acanthion* is furthermore distinguishable from *E. aculeata* (and *setosa*) by the claws of the hind foot, the third claw reaching hardly the half of the length of the second, whilst in the other species these claws are of nearly the same length. A corresponding difference in the strength of the respective phalanges may be observed.

Finally, with regard to the skull it has been already stated that in most respects it agrees almost perfectly with that of *E. aculeata*. Certainly the length is a little greater in the latter species (116 millim.) than in *E. acanthion* (111 millim.); this, however, may perhaps not always be the case.

The shape of the skull, as seen from behind, appears to be to a certain degree varying in both species; but *E. acanthion* seems constantly to have a narrower cerebral area than *E. aculeata*. As mentioned above, Dr. Murie has described in the Journ. of Linn. Soc. vol. xiv. (p. 413) a skull of the species, found by Capt. Armit at Cardwell, thus not far from the York peninsula. In his comparison of the skull with five skulls of *Echidnæ* from S. Australia and Tasmania, he states that it is "barely appreciably narrower across the cerebral area, but decidedly lower in the same region." This feature is characteristic in all the examined skulls of *E. acanthion*, and is still more perceptible in the younger specimens than in the full-grown.

Thus the greatest breadth of the skull is below the *foramen retro-temporale*, whilst the part above gradually decreases upwards; in the full-grown specimens (No. 3 and No. 9) this decrease is less marked, but the skull is never broader above the said *foramen* than below, as in *E. aculeata*. In the latter species the *os temporale* widens upwards (in the two skeletons preserved in the University Museum of Christiania), and the greatest breadth of the skull is therefore immediately above the foramen *retro-temporale*, not below it. Finally, the snout is straight in *E. aculeata* (in the specimens before me), but in all specimens of *E. acanthion* more or less bent upwards.

Comparison with E. lawesi.—In March 1877 Mr. E. P. Ramsay, in Proc. Linn. Soc. New South Wales (vol. ii. p. 30), described an Echidna under the name of *Tachyglossus lawesi* from a specimen just received from Port Moresby in New Guinea.

The type specimen was a skin of a male, which Ramsay considered to be full-grown; its length from the snout to the tip of tail was 13·4 inches, or about 336 millim.

In Sept. 1878 Mr. Ramsay gave a short communication in the same Journal (vol. iii. p. 244) on three more specimens, also from the S.E. coast of N. Guinea. The new specimens consisted also in the dried skins only, and the measurements given in the same place may therefore also be considered as but approximative. The largest specimen had a length of 16 inches from snout to root of tail, and when the length of the tail is added, the total length has been about

425 millim. The other specimens were smaller, had a length to the root of tail of 12 and 12·5 inches, or, with the same calculation, a total length of 325 and 341 millim.

It is evident from Mr. Ramsay's short description and measurements, that *E. acanthion* is very nearly related to *E. lawesi.* The same armature of the back with powerful and closely-set spines, and a very scanty covering with hairs between the spines is found in both; and in both the claws on the hind feet show the same mutual proportions of length, by which they easily may be distinguished from the South-Australian and Tasmanian species.

Although Ramsay's description of *E. lawesi*, on account of the limited materials, could not be very exhaustive, there still seem to exist differences, which entitle us to separate the Australian form from its neighbour on the other side of the Strait. I endeavour below to touch upon the points in which *E. acanthion* seems to differ from *E. lawesi,* although such comparison can only advantageously be made with the specimens of *E. lawesi* themselves, which I have not had an opportunity of seeing.

Besides the short original description of the latter species, I have just received in a letter from my friend Dr. Vinciguerra a few remarks on a specimen in the Museo Civico, in Genoa, received in exchange from Berlin, and examined by Dr. Gestro.

The chief difference between them seems to exist in the length of the snout (and perhaps also that of the skull), which is perceptibly shorter in *E. acanthion* than in the other species.

As to the skull, there is unfortunately no exact statement given of its length in Ramsay's short description of *E. lawesi.* Only in the type-specimen, the total length of which has been about 336 millim., the length of the skull is said to have been four inches, or about 103 millim. This undoubtedly is on the whole larger than in equally large specimens of *E. acanthion.*

This seems also evident from another of the measures given. In Ramsay's type specimen of *E. lawesi,* the total length of which is about 336 millim., the distance from tip of snout to the ear is (skin stretched) 4·5 inches, or 113 millim. In the Genoa specimen, with a total length 377 millim., the same distance is 120 millim. In *E. acanthion,* on the other hand, the length of the skull is 93 millim. in the young male with a total length of 365 millim.; and even in the largest specimen, the total length of which is 448 millim., the skull does not exceed 111 millim.

The length of the snout is measured in all Ramsay's four specimens of *E. lawesi,* and has been found to be as follows[1]:—

Total length	326	millim.	Length of snout	53	milllim.
,, ,,	336	,,	,, ,,	63[2]	,,
,, ,,	341	,,	,, ,,	59	,,
,, ,,	430	,,	,, ,,	61	,,

[1] Calculated from the English measurements.
[2] "From tip of snout to the eye 2·5 inches."

The Genoa specimen measured, according to Dr. Gestro—total length 377 millim., length of snout 53 millim.

As has been already stated (p. 155), even in the largest specimens of *E. acanthion*, with a total length of 440–448 millim., the length of the snout does not exceed 53 millim.; and it may therefore be taken as granted that *E. lawesi* has the snout decidedly longer than *E. acanthion*.

The description of the covering of the skin and the colour does not seem to show any definite difference. Certainly Mr. Ramsay says of *E. lawesi*, "Some of the long cylindrical spines are altogether white, some all black, some particoloured with white or black tips."

To this can be noted, that altogether white spines are very scarce or absent in all specimens of *E. acanthion*, and that none of the particoloured spines have white tips but these are always black-tipped. Furthermore the hairs of the back as stated above are perfectly hidden between the spines in *E. acanthion*; while Mr. Ramsay says of *E. lawesi*, "A few black hairs are scattered through the spines and on the sides of the body," and Dr. Gestro of the specimen in Genoa, "Entre les épines il y a des poiles très-visibles."

Thus the hair-covering between the spines seems to be less scanty in *E. lawesi* than in *E. acanthion*.

Further, the length of the bare portion of the snout in *E. acanthion* (in consequence of the shortness of the snout itself) is never two inches, as in the type specimen of *E. lawesi*, but even in the largest specimens but a little more than one inch and a half.

4. Description d'un nouveau Rongeur du genre *Cœlogenys*. Par Jean Stolzmann.

[Received January 16, 1885.]

Pendant mon dernier voyage dans la république de l'Equadeur on m'a souvent parlé d'un quadrupède, nommé par les indigènes "*Sacha-cui*,"[1] tandis que le paca (*Cœlogenys paca*) y est connu sous le nom de "*Gualilla*." De la description, donnée par les habitants du pays, je supposais que l'animal en question pouvait appartenir au même genre de *Cœlogenys*. Mais comme ce dernier habite les contrées très chaudes et se tient toujours au voisinage des eaux, tandis que le "*Sacha-cui*" est propre à une haute région, renfermée entre 6000 et 10,000 pieds au dessus du niveau de la mer, fréquentant souvent les lieux très éloignés des courants d'eau, je supposais qu'il s'agît d'un quadrupède inconnu, et après m'en avoir procuré une paire d'individus adultes, j'ai reconnu que j'avais raison. Je donne donc sa description, en lui proposant le nom du

Cœlogenys taczanowskii.

C. fusco-brunneus, subtus albicans, lateribus quaternis seriebus

[1] "*Sacha*" (indien)=la forêt; "*cui*" (indien)=cavia.

macularum albarum notatis: capite breviore quam in C. paca: *setis postocularibus minus numerosis.*

Couleur générale des parties supérieures du corps et des côtés est d'un brun noirâtre, avec quatres séries de taches blanches sur chacun des côtés, dont l'inférieure, commençant sur les côtés de la gorge, traverse toute la longueur du corps jusqu'au côté postérieur de la cuisse et est composée de quatorze taches, dont celles du ventre sont presque réunies entre elles; la deuxième commence au dessus de la première tache de la série précédante et finit au dessus de son extrémité; elle est composée de douze taches, dont les médianes sont fort rapprochées entre elles, sans se confondre entièrement; la troisième série, aussi longue que la précédante, est composée de dix taches, parfaitement séparées, commençant au cou; la quatrième, commençant à la moitié de la longueur du corps, est composée de cinq taches moins prononcées que celles des séries précédantes et parcourt près de la ligne dorsale.

Tous les poils foncés sont unicolores, mais plus obscurs à l'extrémité qu'à la racine. Partout entre les poils foncés il y a un faible mélange de poils blancs. Les côtés de la tête sont couverts de poils blanchâtres, mélangés avec de noirâtre; ces derniers sont prédominants sur la région sousoculaire; les poils du menton sont bruns et rares; le reste du dessous du corps est couvert de poils isabelles blanchâtres, avec un mélange de poils foncés sur le devant de la poitrine; les pattes couvertes de poils de la couleur du dos, les poils du metatarse et des doigts des pattes postérieures tirant au roussâtre, sur le côté interne du bas des pattes antérieures se trouve une grande tache dénuée, parsemée de poils blancs, très courts.

Moustaches supérieures noires, les inférieures blanches: quelques-unes de ces dernières dépassent l'oreille. Sur la région médiane entre l'œil et l'oreille se trouve un groupe des soies assez longues. Côtés postérieurs des oreilles couverts de poils rares et peu longs: à son bord inférieur il y a une touffe abondante de poils longs. Ongles cornés, à bords blanchâtres. Face antérieure des dents incisives d'un jaune orangé. Plante des pattes grise foncée.

Iris brun très foncé.

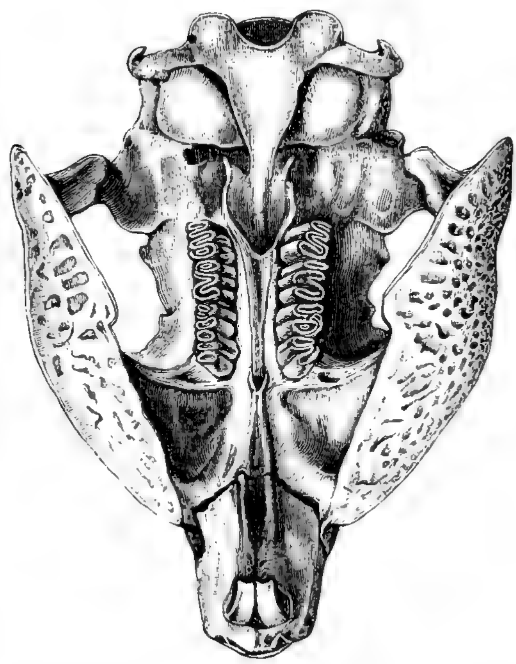
La femelle ressemble au mâle et n'en diffère que par la couleur générale plus foncée, la tête plus petite et moins large.

Les dimensions des différentes parties du corps du mâle.

	mètre.
Longueur de la tête	0·130
Distance entre les narines et l'œil	0·057
Distance entre l'œil et l'oreille	0·042
Longueur totale	0·570
Longueur depuis les épaules à la queue	0·370
Hauteur au garrot	0·225
Hauteur au croupion	0·265
Longueur de la jambe	0·100
Longueur du tarse	0·033

	mètre.
Doigt externe du bras	0·016
,, ,, ongle	0·012
Doigt médian du bras (2me)	0·045
,, ,, ongle	0·018
Doigt médian du bras (3me)	0·041
,, ,, ongle	0·017
Doigt médian du bras (4me)	0·035
,, ,, ongle	0·017
Doigt interne du bras	0·005
,, ,, ongle	0·005
Avant bras	0·080
Metacarpe	0·020
Doigt externe de la patte	0·016
,, ,, ongle	0·011
Doigt médian de la patte (2me)	0·020
,, ,, ongle	0·014
Doigt médian de la patte (3me)	0·024
,, ,, ongle	0·016
Doigt médian de la patte (4me)	0·021
,, ,, ongle	0·013
Doigt interne de la patte	0·000
,, ,, ongle	0·005

Fig. 1.



Skull of *Cœlogenys taczanowskii* (lower surface).

Cette nouvelle forme diffère du *C. paca* par la tête beaucoup plus courte, surtout dans sa partie anté-oculaire: par la couleur générale beaucoup plus foncée, brun noirâtre au lieu de marron, et par la disposition de taches blanches, formant trois séries complètes sur chacun des côtés, une dorsale incomplète et une inférieure en travers de la cuisse, tandis que chez le *C. paca* il n'y a que deux séries complètes, la troisième—supérieure—incomplète et celle de la cuisse. La limite entre la couleur foncée des côtés et le blanc de l'abdomen n'est pas aussi nettement tranchée, que chez le *C. paca*: la bande foncée, renfermée entre la dernière série des taches latérales et le blanc du ventre, et moins large et moins régulière. Le poil est partout beaucoup plus long et beaucoup plus abondant.

Les longueurs des poils de deux espèces.

	C. paca.	*C. taczanowskii.*
	mètre.	mètre.
Moustache la plus longue	0·096	0·120
Poil de la région inter-auriculaire	0·012	0·029
Poil du milieu du dos	0·013	0·035
Poil du croupion	0·020	0·034
Poil des joues	0·009	0·029
Poil du bord inférieur de l'oreille	0·017	0·031
Poil de la queue	0·009	0·019

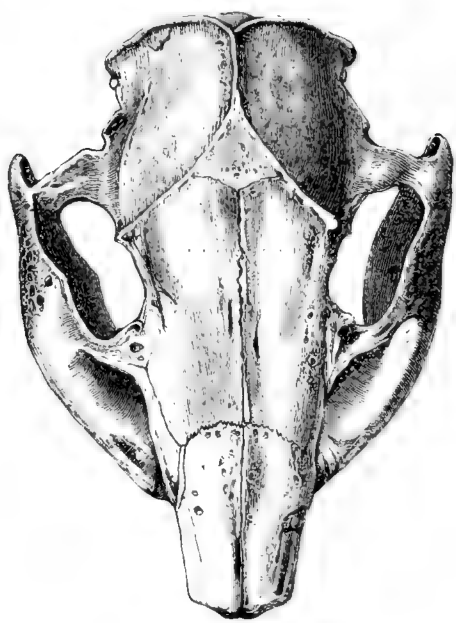
Fig. 2.

Lower jaw of *Cœlogenys taczanowskii.*

La différence dans les détails ostéologiques est aussi très importante.

Le crâne est relativement plus petit, mais plus large. La proportion entre la longueur et la largeur du crâne est de 1·38, tandis que chez le *C. paca* elle est de 1·50. Les sillons sont presque nuls au front et beaucoup moins saillants sur l'arcade zygomatique que chez le *C. paca*. Le trou infra-orbitaire plus grand et d'une forme ovale. La fosse dans la partie inférieure du trou infraorbitaire est récouverte, tandis que chez le paca elle présente un canal ouvert. L'orbite avec la cave temporale possède une forme ovale, allongée du devant en arrière. L'apophyse lacrymale presque complètement atrophiée. La ligne des molaires est plus longue ; les deux rangées sont presque parallèles entre elles, tandis que chez le paca elles sont divergeantes en arrière.

Fig. 3.



Skull of *Cœlogenys taczanowskii* (upper surface).

La suture naso-frontale peu arquée et sans angles saillants, propres au *C. paca*. Les replis des molaires se distinguent par leurs coins aigus au lieu d'être arrondis, comme chez le paca ; ils sont donc mieux marqués dans l'espèce nouvelle. Les incisives relativement plus longs, à la surface antérieure jaune-orangée, un peu plus foncée dans ceux de la mâchoire supérieure que dans l'inférieure ; ils sont jaunes-clairs chez le paca. La mâchoire inférieure, quoique plus petite que chez le paca, est plus forte. Les crêtes et les proéminances y sont moins nombreuses et moins saillantes. Les molaires présentent les mêmes caractères que ceux de la mâchoire supérieure.

Dimensions des différentes parties du crâne de deux espèces.

	C. taczanowskii. mètre.	*C. paca.* mètre.
Longueur du crâne	0·124	0·150
Distance entre le bord antérieur de l'os intermaxillaire et le *Foramen magnum*	0·117	0·140
Distance entre le bord antérieur de l'os intermaxillaire et le bord postérieur du palais	0·076	0·090
Distance entre le bord antérieur de l'os intermaxillaire et le premier molaire	0·052	0·065
Largeur du palais entre les molaires antérieurs	0·0085	0·010
Largeur du palais entre les molaires postérieurs	0·012	0·014
Longueur des nasaux (prise sur la ligne médiane)	0·045	0·052
Longueur des frontaux (prise sur la ligne médiane)	0·044	0·062
Longueur des pariétaux (prise sur la ligne médiane)	0·033	0·040
Largeur de museau devant le trou infra-orbitaire	0·030	0·030
Largeur (la plus grande) du front	0·048	0·062
Largeur du front entre les orbites	0·035	0·043
Largeur (la plus grande) du crâne	0·090	0·100
Largeur de la partie inférieure du crâne (entre les trous auriculaires)	0·048	0·050
Largeur du *Foramen magnum*	0·016	0·014
Hauteur du *Foramen magnum*	0·012	0·013
Longueur du trou infra-orbitaire	0·043	0·040
Largeur du trou infra-orbitaire	0·017	0·012
Longueur de l'orbite + la cave temporale	0·040	0·042
Distance entre le bord antérieur des intermaxillaires et le bord antérieur de l'orbite	0·066	0·080
Largeur (la plus petite) de l'arc, qui sépare le trou infra-orbitaire de l'orbite	0·005	0·010
Longueur de la rangée des molaires (mâchoire supérieure)	0·029	0·028
Longueur des incisives (mâch. supér.)	0·021	0·019
Longueur de l'arcade zygomatique	0·081	0·100
Largeur de l'arcade zygomatique	0·050	0·060
Longueur de la mâchoire inférieure	0·090	0·100
Longueur de la rangée des molaires (mâch. inférieure)	0·030	0·030
Longueur des incisives (mâch. inférieure)	0·030	0·038

Dimensions des molaires du C. taczanowskii.

Mâchoire supérieure.		*Mâchoire inférieure.*	
1r	0·006 longueur.	1	0·006 longueur.
	0·005 largeur.		0·004 largeur.
2me	0·005 longueur.	2me	0·006 longueur.
	0·006 largeur.		0·006 largeur.
3me	0·008 longueur.	3me	0·007 longueur.
	0·007 largeur.		0·007 largeur.
4me	0·008 longueur.	4me	0·008 longueur.
	0·006 largeur.		0·007 largeur.

Le mâle du *C. taczanowskii*, dont les mesures ont été données ci-dessus, paraît être complètement adulte. Néanmoins son crâne présente plusieurs caractères du jeune du *C. paca*, comme par exemple le manque des sillons sur le front, le moindre développement des sillons sur l'arcade zygomatique et le manque des angles saillants dans la suture naso-frontale. Je suis donc conduit à croire, que c'est une forme plus primitive que le *C. paca*, l'opinion qui se confirme aussi par la structure plus primitive des molaires chez l'espèce nouvelle.

Mœurs et habitudes.—La forme, dont je me permets de présenter la description, habite les montagnes de l'Equadeur entre 6000 et 10,000 pieds au dessus du niveau de la mer. Elle n'est pas très rare dans les forêts des deux versants des Andes. A la manière du paca, le "*Sacha-cui*" creuse un terrier à deux sorties, où il se refugie devant la persécution des ennemis. D'après l'opinion du chasseur, qui m'a fourni les deux exemplaires, qui se trouvent actuellement au Musée Zoologique de Varsovie, le couple habite le même trou. La femelle, qui était prise au mois de Mars, était au point de mettre bas un petit. La viande du "*Sacha-cui*," qui possède un goût exquis, est très recherchée par les habitants du pays.

On le chasse à l'aide des chiens, devant lesquels l'animal se refugie dans son terrier; on bouche alors une des sorties, on met du feu dans l'autre et on tue à coups de baton l'animal, qui veut orcer la sortie.

Je suis heureux de pouvoir dédier cette curieuse forme à mon ami, Mr. Ladislas Taczanowski, savant conservateur du Musée Zoologique de Varsovie et promoteur de nos voyages dans l'Amérique Méridionale.

February 17, 1885.

Osbert Salvin, Esq., F.R.S., Vice-President, in the Chair.

The Secretary made the following report on the additions to the Society's Menagerie during January 1885:—

The total number of registered additions to the Society's Menagerie during the month of January was 81, of which 6 were by birth, 41 by presentation, 22 by purchase, 1 by exchange, and 11 were received on deposit. The total number of departures during the same period, by death and removals, was 100.

The most noticeable additions during the month were:—

1. A female Black-and-Yellow Hawfinch (*Mycerobas melanoxanthus*) from Northern India, and an Andaman Starling (*Sturnia andamanensis*) from the Andaman Islands, purchased January 10th. Both these species are new to the Society's Collection.

2. A young male European Moose (*Alces machlis*), presented by Evelyn Hubbard, Esq., January 22nd. Mr. Hubbard informs us that this animal was captured on the Ladoga, Russia, when evidently but just dropped, in June 1884. It has been placed in the Gardens in company with an American specimen of the Moose, purchased in April 1884, so that the two forms of this animal, sometimes supposed to be of different species, may now be seen side by side.

3. A pair of Yaks (*Poëphagus grunniens*), purchased January 23rd.

The following papers were read:—

1. On the Structural Characters and Classification of the Cuckoos. By Frank E. Beddard, M.A., F.R.S.E., Prosector to the Society.

[Received February 17, 1885.]

The structure of the Cuckoos and their affinities to other birds have been discussed by several writers; but no one, so far as I am aware, has attempted to indicate the mutual resemblances and differences between the very numerous genera which compose the family, except as regards particular structures: thus Nitzsch[1] has pointed out the variations in the disposition of the feather-tracts, and Garrod has classified the Family by the muscles of the thigh[2]. In the present paper it will be my endeavour to supply this deficiency so far as the material accessible enables me to do so, and to record those structures which vary in the different genera of Cuckoos, laying particular stress upon such as appear to bear upon the classification of the family.

[1] Pterylography, Eng. Ed. p. 91. [2] Coll. Papers, p. 220.

The genera which I have studied myself are the following:—

Cuculus.	*Eudynamis.*
Cacomantis.	*Phœnicophaes.*
Piaya.	*Crotophaga.*
Saurothera.	*Geococcyx.*
Coccyzus.	*Centropus.*
Diplopterus.	*Pyrrhocentor.*
Guira.	

I have also been able to incorporate some deductions from the MS. notes of my two predecessors upon *Chrysococcyx* and *Coüa.*

There remain therefore a considerable number of genera which I have not been able to examine; such an omission will doubtless take away from the value of the scheme of classification proposed here; but in any case the facts recorded will, I trust, remain as facts and be at least an assistance towards a proper classification even if they do not indicate its main outlines.

Mr. Sharpe, in a paper on the Cuckoos of the Ethiopian Region [1], distinguishes two subfamilies—(1) *Cuculinæ,* including only *Cuculus* and *Coccystes,* and (2) *Phœnicophainæ,* including *Phœnicophaes, Coua, Centropus,* &c. This division appears to me to be, so far as I have been able to follow it by a study of the anatomical characters of the several genera, a natural one. I have separated, as will be seen later, *Phœnicophaes* and *Eudynamis* from the other genera belonging to Mr. Sharpe's subfamily Phœnicophainæ into a distinct subfamily, for which I retain his name, including the other genera *Centropus, Coua,* &c. in a separate subfamily which may be termed Centropodinæ; nevertheless there is a far closer agreement between the Phœnicophainæ and Centropodinæ than between either of these and the Cuculinæ. Mr. Sharpe further remarks that it is difficult to place the American genus *Neomorphus* away from *Phœnicophaes*; that it is impossible to separate the American from the Old-World Cuckoos I hope to be able to show in the present paper.

The structures which I have chiefly made use of for classificatory purposes are, (1) the muscles of the thigh, (2) the syrinx, (3) the pterylosis; the variations exhibited elsewhere do not appear to me to be of sufficient importance to serve as a standard of classification.

It may, however, be worth while to record briefly some of the differences that I have noticed in other structures besides the three which I propose to describe more or less in detail.

The *gall-bladder* is stated by Owen [2] to be wanting in almost all the Cuculidæ. This statement is by no means correct; indeed the gall-bladder appears to be very generally present and those cases where it is absent are the exceptions; it is present in *Saurothera, Coccyzus, Pyrrhocentor,* and *Cuculus,* but appears to be absent in *Crotophaga,* and occasionally in *Centropus*: *Coua* according to Milne-

[1] P. Z. S. 1873, p. 578.

[2] Comp. Anat. vol. ii. p. 177.

Edwards[1] has a gall-bladder; I have failed to find one in *Eudynamis orientalis*.

Seeing that the gall-bladder is occasionally absent and occasionally present in the same genus (*Centropus*), it does not appear to me to be advisable to make use of it as a systematic character.

The variations exhibited in the tendons of the patagium are very inconspicuous; the general disposition of the tendon of the *tensor patagii brevis* has been described by Garrod[2]; the only genus which at all departs from this is *Geococcyx*, in which the tendon of the *tensor patagii brevis* sends off a short branch forwards attached to the *extensor metacarpi radialis* a little way in front of the attachment of the main part of the tendon.

The number of rectrices is not, as Nitzsch has stated, constantly 10; in *Guira* and *Crotophaga* this number is reduced to 8. This is another reason in addition to those stated below for associating together these two genera.

Muscles of the Thigh.—Mr. Garrod has proposed to divide the Cuculidæ into two subfamilies according to whether they possess or lack the accessory femoro-caudal muscle; the muscle-formula of one group, the *Centropodinæ*, is therefore A B X Y; that of the second subfamily, the *Cuculinæ*, A X Y; adding to his list those species subsequently dissected by himself and also by Mr. Forbes and by myself, I find the following arrangement:—

Centropodinæ, A B X Y.	Cuculinæ, A X Y.
Centropus phasianus.	*Cuculus canorus.*
Geococcyx affinis.	*Coccyzus americanus.*
Geococcyx sp.	*Piaya cayana.*
Crotophaga ani.	*Cacomantis sepulchralis.*
Pyrrhocentor celebensis.	*Saurothera dominicensis.*
Rhinococcyx curvirostris.	*Saurothera vielloti.*
Guira pirigua.	*Diplopterus nævius.*
Phœnicophaes sp.	
Eudynamis taitensis.	
Eudynamis orientalis.	

Syrinx.—So far as I have had the opportunity of studying the structure of the syrinx in the Cuckoos, this organ appears to present two chief modifications:—(1) the ordinary tracheo-bronchial syrinx as in *Cuculus*; (2) the bronchial syrinx, which has been long known as characteristic of *Crotophaga*, but which also distinguishes a number of other genera. In the following brief description of the syrinx in the several genera only the more essential points have been indicated.

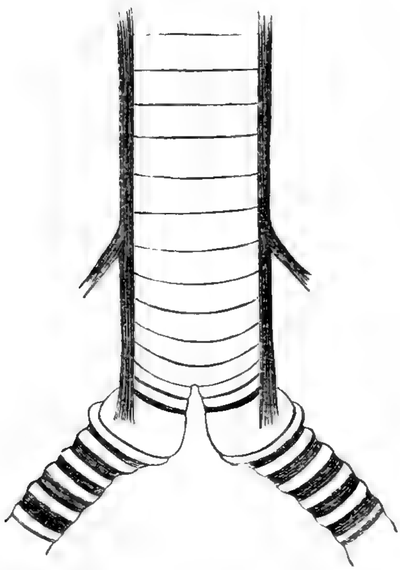
Cuculus canorus.—The syrinx is tracheo-bronchial; the tracheal and first bronchial rings are largely ossified; the anterior tracheal rings are of uniform width throughout; the posterior rings, as in *Steatornis*[3] and other birds, alternately overlap each other, and so

[1] Histoire Nat. de Madagascar, Texte i. 1e partie, p. 174.
[2] *Loc. cit.* p. 360.
[3] *Cf.* Garrod, Coll. Papers, p. 184.

present the appearance of being wider on one side than on the other; the first four bronchial semirings increase in length and in breadth progressively; they are ossified and firmly united together; to the last of these the single syringeal muscle of either side is attached; there is a well-developed bony pessulus which does not fuse with the last tracheal ring anteriorly, but is inserted between its slightly divaricated extremities; the remaining bronchial semirings are cartilaginous.

Piaya cayana.—The syrinx of this Cuckoo is tracheo-bronchial; the last ring of the trachea (see fig. 1) is considerably more slender than the rest; the two first bronchial semirings are of about the same diameter; the third bronchial semiring is of, comparatively speaking, enormous size, and to it are attached the intrinsic muscles of the syrinx, one on either side; the following ring is much narrower, but about the same lateral diameter; the rest rapidly diminish in size.

Fig. 1.



Syrinx of *Piaya cayana*.

The syrinx of *Saurothera dominicensis* resembles in almost every particular that of *Piaya cayana*; the only difference worth remarking upon is that the third bronchial semiring, to which the intrinsic muscles of the syrinx are attached, is not so markedly larger than the other rings of the bronchi.

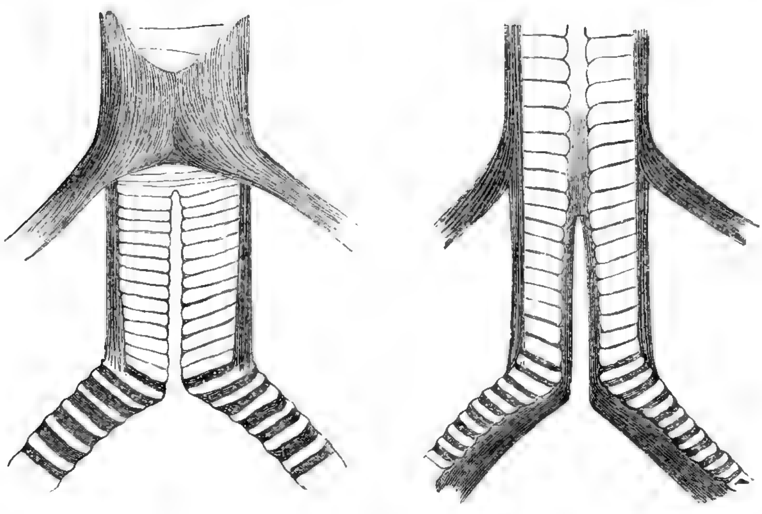
Diplopterus nævius, again, shows no great differences in the structure of its syrinx from *Piaya* and *Saurothera*; it more particularly resembles the latter in the comparatively small size of the third bronchial semiring.

Eudynamis taitensis.—The syrinx is on the whole similar to that of *Cuculus.* The last tracheal ring and the first three bronchial semirings are completely ossified; there is a strong bony pessulus present; the syringeal muscles are attached to the third bronchial semiring; the succeeding bronchial semirings are slight and cartilaginous; from the first of these an oval thick ossified piece projects into the substance of the membrana tympaniformis.

Phœnicophaes, as far as could be made out from a single damaged syrinx, presents no important differences from *Eudynamis.*

In *Pyrrhocentor celebensis* the syrinx is bronchial; on the dorsal side the last tracheal rings are incomplete and pass gradually without any break into the bronchial semirings; there is a slender pessulus attached to the last tracheal ring ventrally; ventrally the tracheal rings are complete; the bronchial semirings increase gradually in breadth up to the 16th; the 16th and 17th rings are considerably stouter than the rest; the remaining rings of the bronchi are very

Fig. 2.



a. Front. *b.* Back.

Syrinx of *Centropus ateralbus.*

slight; the inner ends of the bronchial semirings are connected by a continuous membrane, which is extremely narrow until about the 13th ring, when it widens out and forms the membrana tympaniformis; this region of the bronchus forms the vocal organ.

There is a single pair of syringeal muscles which form a flat thin layer nearly completely covering the ventral surface of the bronchi and attached below to the 16th bronchial semiring.

In *Centropus ateralbus* (fig. 2) the syrinx is much like that of *Geococcyx* and *Pyrrhocentor*, and, as might be expected, is more particularly similar to that of the last genus. The bronchial rings are incomplete internally and closed by membrane; in the first fifteen rings the membranous area is very narrow, but it widens out at the 16th ring, where the voice-organ is situated; the 16th and 17th rings are considerably stouter and stronger than the rest, and to the former are attached the syringeal muscles; the extrinsic muscles of the syrinx are given off from the trachea just before its bifurcation.

Centropus rufipennis has a perfectly similar syrinx.

Geococcyx affinis.—The syrinx of *Geococcyx* is constructed on the same type as that of *Pyrrhocentor*, and indeed resembles it so closely that no special description is necessary; the voice-organ is, however, a little nearer to the trachea, the intrinsic muscles being inserted upon the 13th bronchial semirings.

Crotophaga ani is well known to possess a bronchial syrinx, which may be considered as more specialized than that of *Geococcyx* and *Pyrrhocentor*, in that the membrana tympaniformis is limited to the posterior bronchial rings, commencing with about the 7th, and does not extend up to the point of bifurcation of the bronchi; in this respect the syrinx of *Crotophaga* resembles that of *Steatornis*, which has been carefully described by Prof. Garrod [1].

As in that bird, the bronchi arise from the trachea much as they do in the Mammalia; the first nine rings of each bronchus are entire; the tenth and eleventh rings are considerably wider from side to side, and their extremities are connected by membrane which forms the inner neck of the bronchus; the succeeding rings become gradually narrower and are similarly completed internally by membrane. In *Steatornis* the membrana tympaniformis is only of limited extent, the posterior rings of the bronchi being, like the anterior rings, complete; in *Crotophaga* this is not the case—all the bronchial rings, commencing with the seventh, are semirings; there is a single pair of slender intrinsic muscles attached one on each side to the tenth bronchial semiring.

Guira.—The syrinx of *Guira pirigua* is a very remarkable one; on a superficial view it appears to resemble very closely that of *Cuculus*, and to be tracheo-bronchial instead of bronchial, as would be expected from the close agreement in other structural characters of *Guira* with *Crotophaga* and *Geococcyx*; a closer examination, however, shows that the syrinx is really bronchial.

The apparent resemblance to the tracheo-bronchial syrinx is caused by the fact that the voice-organ of *Guira* is situated at the upper end of each bronchus close to the trachea, instead of being as in *Crotophaga* nearer to the entrance of the bronchus into the lung; the first two or three rings of each bronchus are complete rings; from the fourth onwards the rings only occupy the outer section of the bronchus and are completed internally by membrane; the sixth semiring is closely attached to the preceding bronchial rings and upon it are inserted the syringeal muscles. There is another peculiarity in this syrinx in the presence of an additional pair of muscles lying on the dorsal surface and attached to the end of the trachea;

[1] Coll. Papers, p. 188.

the remaining bronchial semirings are not closely united, but separated by considerable membranous intervals.

Impressed by the difficulty of detecting the true nature of the syrinx in *Guira piriqua*, I carefully reexamined *Phœnicophaes* and *Eudynamis* to prevent a possible error in the statement just made concerning the syrinx of these two genera, but I was unable to see that the syrinx was other than tracheo-bronchial as in *Cuculus*, *Piaya*, &c.

Coua ruficeps.—The following description of the syrinx of this Cuckoo is compiled from sketches made by Prof. Garrod. It appears to resemble in all essentials the syrinx of *Centropus*, *Pyrrhocentor*, &c.; the first seven bronchial semirings are more or less firmly united, and their inner extremities are separated by a narrow membranous interval; the intrinsic muscles of the syrinx are attached to the seventh bronchial semiring; the remaining semirings are not so complete as the anterior ones, and the extent of the membrane uniting their inner extremities is therefore wider and forms the membrana tympaniformis.

Pterylosis.—The fact that the various genera of Cuckoos differ in the arrangement of the feather-tracts was first pointed out by Nitzsch. He distinguished three groups: in the first "the pectoral portion of the inferior tract is dilated, uniformly sparsely feathered, and extended over the whole breast;" to this group belong *Cuculus* and *Eudynamis*. In the second group, "the pectoral portion of the inferior tract is not quite so broad but more densely feathered, and encloses posteriorly a narrow insular space;" this group contained the genera *Scythrops*, *Centropus*, *Crotophaga*, *Saurothera*, &c. Finally, the Phœnicophainæ are characterized thus:—"The dilated pectoral part of the inferior tract is narrow and of uniform breadth, and encloses no space."

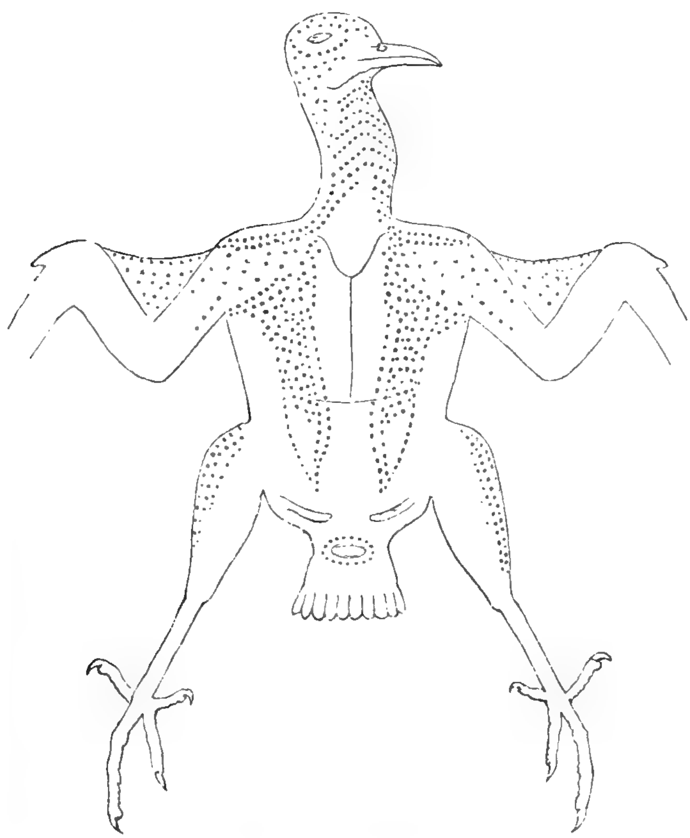
I do not find, however, that Nitzsch's account applies altogether to the specimens that I have studied, though he is undoubtedly right in calling attention to the considerable differences that are found in the arrangement of the feather-tracts in this family. Before indicating what appear to me to be the classificatory results that may be obtained from a study of the pterylosis of the Cuculidæ, it will be best to describe the genera separately.

Cuculus canorus.—Nitzsch's description of the pterylosis of this Cuckoo appears to me to be for the most part correct; I recapitulate it here for the purposes of an easier comparison with the other types.

The feathering on the throat completely occupies the intermandibular space, the feathers are more closely placed anteriorly and become more sparsely distributed posteriorly. The ventral tract is very soon separated into its two halves, in each of which the feathers are arranged in parallel lines inclined at an oblique angle to either axis of the neck. Over the sternum the pectoral tract is very wide, becoming gradually narrower posteriorly until it terminates in a single row of feathers some way in front of the anus. There is no indication of any division of the ventral tract such as is characteristic of the genera *Centropus*, *Geococcyx*, &c.; but the three rows of feathers which form the posterior portion of the tract become separated from each other by intervals, as in *Cacomantis*, before reuniting in front of the cloaca. The spinal tract is narrow in the neck, and up to a little way beyond its bifurcation, between the shoulder-blades, is strongly feathered; the rest of the spinal tract encloses, as in other Cuckoos, a lanceolate space, and is continuous behind with a strong row of feathers running to the base of the oil-gland.

Cacomantis sepulchralis.—The pterylosis of this Cuckoo is not

Fig. 3.



Pterylosis of *Cacomantis sepulchralis.*

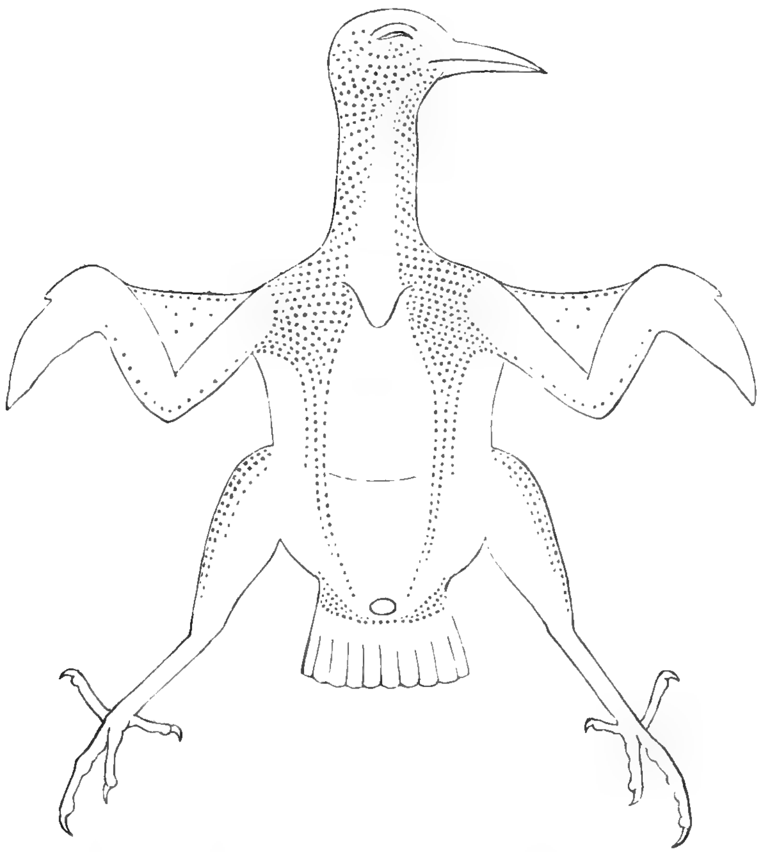
widely different from that of *Cuculus*. The inferior tract divides into two about halfway down the neck; the skin lying between the rami of the mandibles is free from feathers on either side of the middle line, which is occupied by the commencement of the feather-tract, but the space thus left bare is extremely narrow. On the pectoral region the feathering is strong, about four feathers wide over the whole of the sternum; below the attachment of the humerus a stronger band is given off which runs as far as the axilla, and a few scattered feathers in front of this also connect the ventral tract with the wing; just at the posterior margin of the sternum the feathers of the ventral tract become arranged in three rows, one deep, and the interspaces between the rows become wider and then again narrow in front of the anus; the ventral tract ceases to be distinguishable on either side at about the end of the pubes.

The upper surface of the head is completely feathered; the spinal tract does not seem to differ much in its disposition from other Cuckoos.

This description also applies to *Cacomantis lanceolatus*.

Piaya cayana.—The inferior tract (fig. 4) is divided from the point of

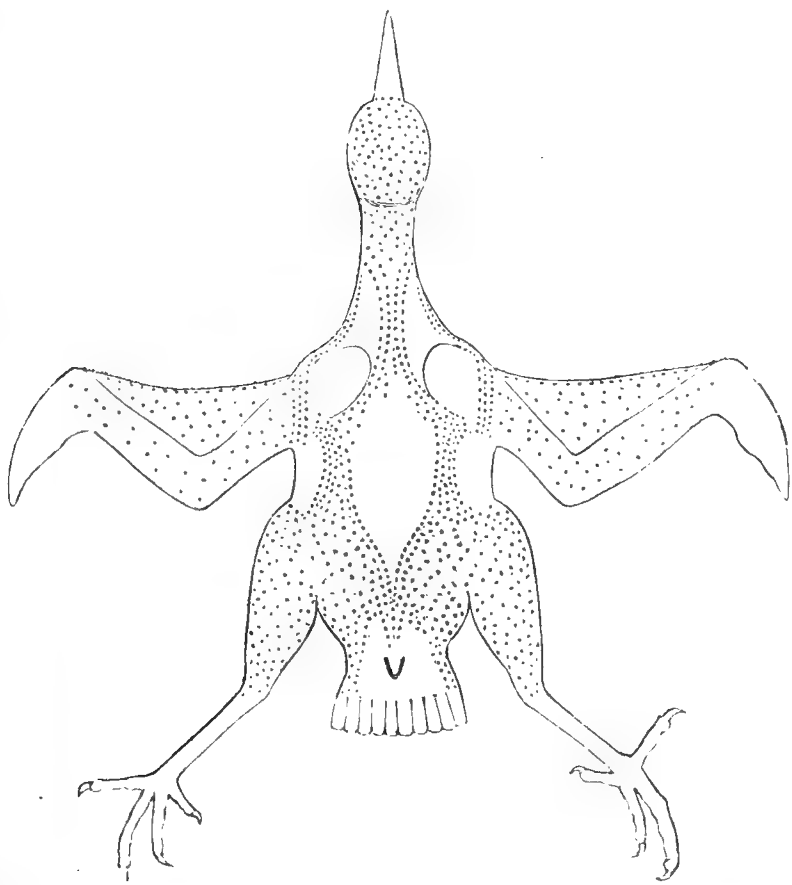
Fig. 4.



Pterylosis of *Piaya cayana*.

its origin at the base of the mandibular symphysis; at the junction of the head with the neck it gives off a number of branches arranged parallel with each other joining the dorsal tract, as shown in the accompanying figure; further down it is continuous with the humeral tract; on the pectoral and abdominal regions the tract on either side is very narrow, only two or three feathers wide upon the hinder portion of the sternum, and terminating just in front of the cloacal aperture; the widest section of the pectoral portion of the tract is close to the origin of the humerus, where it gives off a short branch to the under surface of the wing; beyond this branch the tract is about three feathers wide and narrows gradually, as already stated, to its termination just in front of the cloaca.

Fig. 5.



Pterylosis of *Piaya cayana*.

Just on a level with the posterior margin of the sternum (as near as I could judge from a specimen that has been considerably damaged) the breadth of the ventral tract decreases from three to two feathers, and at this point the outer row of feathers diverges somewhat from the inner tract and thus forms a small rudiment of the outer bifurcation of the ventral tract found in *Geococcyx*, &c.; this outer bifurcation is only three feathers long in *Piaya cayana*[1].

The upper surface of the head is sparsely feathered; the spinal tract is first continuous round the sides of the neck with the paired ventral tract; posteriorly it narrows, and at the level of the anterior end of the scapula bifurcates into two slender branches, each composed of only four feathers, arranged as shown in the drawing (fig. 5, p. 177); posteriorly there is a slight break between this portion of the dorsal tract and the rest, which is considerably wider and is continuous with the feathering on the upper surface of the thigh; about opposite the attachment of the femur the spinal tract of both sides becomes fused and runs as a single tract closely feathered to the base of the oil-gland. On the ventral surface of the uropygium are two short tracts, one on either side, which unite behind the aperture of the cloaca; these are not continuous with the ventral tracts in front, but with the dorsal tract and the feathering over the thigh.

It will be clear from this description of the pterylosis that *Piaya cayana* should be placed in the Cuculine division of the family, and the structure of its syrinx is in harmony with this arrangement. On referring to Nitszch, however, I find that *Piaya cayana* (under the name of *Coccygius cayanus*) is placed in the same group with *Centropus*, *Crotophaga*, &c. I cannot agree with this systematization at all. In only one individual of *Piaya cayana*, examined by myself, the inferior tract of either side showed a faint trace of a bifurcation posteriorly, and though the comparatively narrow inferior tract with its close feathering is rather different from that of *Cuculus*, it is clearly with that genus rather than with *Geococcyx* that *Piaya cayana* should be classified.

Coccyzus americanus.—The ventral tract, as in *Piaya cayana*, is double from just after its point of origin at the mandibular symphysis; the two halves, however, reunite before the junction of the head with the neck, but very shortly after again become separate. The rest of the ventral tract is so like that of *Piaya* that there is no need to describe it; I did not, however, find the rudimentary outer branch indicated in the figure of *Piaya*, but as this part of the skin was rather damaged, I cannot speak with certainty. The spinal tract is like that of *Piaya*, but the break between the anterior and posterior sections of the tract hardly exists.

Saurothera dominicensis.—The inferior tract is double at its point of origin close to the mandibular symphysis, as in *Piaya cayana*; each tract is here extremely narrow, two to three feathers wide, and is separated from its fellow and from the edge of the mandible by narrow spaces devoid of feathers, each of which is almost exactly of the same width as the tract itself.

At the junction of the head with the neck the inferior tract becomes single, and the feathers have the chevron-like arrangement already referred to in other genera; about halfway down the neck the

[1] I only noticed this in one specimen; in others each pectoral tract was quite single.

inferior tract again divides, and each half is continued on either side of the sternal carina, narrowing gradually, until the termination, a little way in front of the cloaca; on either side a branch two feathers wide is given off to the humeral tract and another of the same width to the row of feathers which occupies the anterior portion of the patagium; the inferior tract of either side has no outer branch; and the disposition of the whole tract is therefore similar to that of *Cuculus* and *Piaya*, more especially the latter. The spinal tract is narrow and very closely feathered upon the neck; it bifurcates into two narrow, also closely feathered tracts at the junction of the neck with the body; the rest of the spinal tract is separated by a distinct break from the anterior portion, and considerably wider, and at the same time less closely feathered upon the lumbar region, where it is continuous with the femoral tract; on a level with the articulation of the femora the two halves of the spinal tract reunite and run as far back as the base of the oil-gland as a single closely-feathered tract.

Diplopterus nævius.—I have only been able to examine one example of this Cuckoo, but, so far as I could make out from that example, the pterylosis agrees fairly closely with that of the Cuculine forms, as it might be expected to do from the structure of the syrinx; I do not, however, feel able to speak at all positively upon the subject.

Geococcyx.—Of this genus I have been able to examine *Geococcyx affinis*, and another species not named; it does not present any differences from *G. affinis*.

The ventral tract commences from the point of junction of the two rami of the lower jaw, and at first only occupies the extreme middle of the area of stem uniting the mandibles; further back it becomes wider; on the neck the feathers have the characteristic arrangement already referred to under the description of *Centropus*. The ventral tract, after giving off a single row of feathers to the hyposternum, divides as usual: the inner broader limb is two feathers wide, the outer is a single row of feathers; they do not reunite posteriorly.

The spinal tract increases in strength, but decreases in width, towards the junction of the neck with the trunk; as in other species (e. g. *Centropus*) there is a complete, or an almost complete, break between the cervical portion of the spinal tract and its two posterior halves; furthermore the anterior portion of the tract does not bifurcate posteriorly, but ends abruptly between the shoulder-blades, being at this point two feathers wide. The spinal tract is not connected with the humeral tract, there is a completely nude space between them. The two halves of the posterior section of the spinal tract are separated by a considerable break from the cervical section; at first each is formed of a very few scattered feathers, but the feathering soon gets stronger; at about the level of the attachment of the femora the two halves of the spinal tract unite.

The femoral tract is very distinct in this Cuckoo, more so than in any species which I have examined: instead of a diffuse feathering over the whole upper surface of the thigh, the feathers are mainly concentrated into a stout band which traverses the upper part of the thigh in a direction nearly at right angles with its long axis.

Pyrrhocentor celebensis.—In so far as I could make out from a considerably damaged specimen, the pterylosis of *Pyrrhocentor celebensis* is "Centropine," and hardly differs except in detail from *Centropus* (see fig. 7, p. 184) and *Geococcyx.*

The spinal tract is strong on the neck, about five feathers wide; at the commencement of the shoulder-blades (at the point of junction of the coracoid and scapula) the feathering seems to disappear altogether for a short space. As in the other genera of the family, the dorsal tract becomes double posteriorly, uniting at about the level of the articulation of the femora to form a single tract rather more closely feathered and running nearly as far as the base of the oil-gland. Behind the shoulder-blades each half of the spinal tract becomes of considerable width, though sparsely feathered, and is completely continuous with a uniform sparse feathering on the surface of the thigh.

The two sides of the ventral tract only become separated near the junction of the neck with the body.

The feathers of the neck portion of the ventral tract are, as in so many other species, arranged in parallel rows separated by considerable intervals; the rows of one side are inclined to those on the other at an angle of about 60°, thus forming a series of "chevrons" very characteristic of these birds. The interspaces between the rami of the mandibles appear to be entirely occupied by rows of feathers; for a very short distance the inferior tract of the neck is continuous with the superior tract. At the commencement of the thorax the ventral tract bifurcates and gives off the humeral tract, which is at first three feathers, and subsequently two feathers, wide. On a level with the anterior margin of the sternum the ventral tract of either side bifurcates into an inner and outer limb; the latter is at first of some width, extending towards the axilla, and being continuous with a single row of feathers separated by wide intervals upon the hyposternum; posteriorly it is only one feather wide and passes back parallel to the inner limb to its termination some way in front of the anus; the inner limb of the ventral tract is regularly two feathers wide.

Guira pirigua.—The ventral tract commences with a narrow row of feathers occupying the middle of the space between the two rami of the mandible, either side of this space being bare; further back, however, the feathering fills the whole of the space between the mandibles. At a point some way below the articulation of the humerus with the shoulder-girdle, the pectoral tract of either side divides into two branches, and is here quite continuous with the humeral tract; the inner branch is two feathers wide at its commencement; just before its termination in front of the cloaca, it becomes reduced to a single row of feathers. The outer branch is at first rather wider than the inner branch; from its commencement to the axilla it is two to three feathers wide; at the axilla it emits a row of feathers to the wing; the posterior portion of the tract from this point onwards is composed of but a single row of closely-set feathers; neither here nor in any other of the types examined by me could I see that the two branches of each pectoral tract become reunited, though Nitzsch describes and figures such an arrangement.

The spinal tract is narrow and very closely and strongly feathered upon the neck; it is separated by a considerable interval devoid of feathering from the humeral tract; the latter is of a triangular form, wider anteriorly than posteriorly; the spinal tract bifurcates between the scapulæ, and for the rest of its extent is covered by weak scattered feathering. As in other Cuckoos, the two halves of the spinal tract reunite some way in front of the oil-gland, and form a single tract more densely feathered.

Crotophaga ani.—The disposition of the feather-tracts in this Cuckoo has been described by Nitzsch.

The inferior tract commences at the mandibular symphysis and passes back as a single tract to about the middle of the neck, where it bifurcates; the skin of the throat lying between the rami of the mandibles is bare on either side of the median tract as in *Geococcyx*.

The ventral tract is described by Nitzsch (*l. c.* p. 91) as dividing into two branches, which reunite at a level with the hinder margin of the sternum. In an example of *Crotophaga ani* examined by myself this was certainly not the case; the disposition of the two branches of this tract was precisely like what has already been described in *Centropus*.

The head is continuously but sparsely feathered; between the shoulders the spinal tract bifurcates, each branch being at first but one feather wide; at the commencement of the double portion of the spinal tract the feathers are very widely separated; later on they get closer together, and this portion of the tract appears at first sight to be completely separated from the cervical portion.

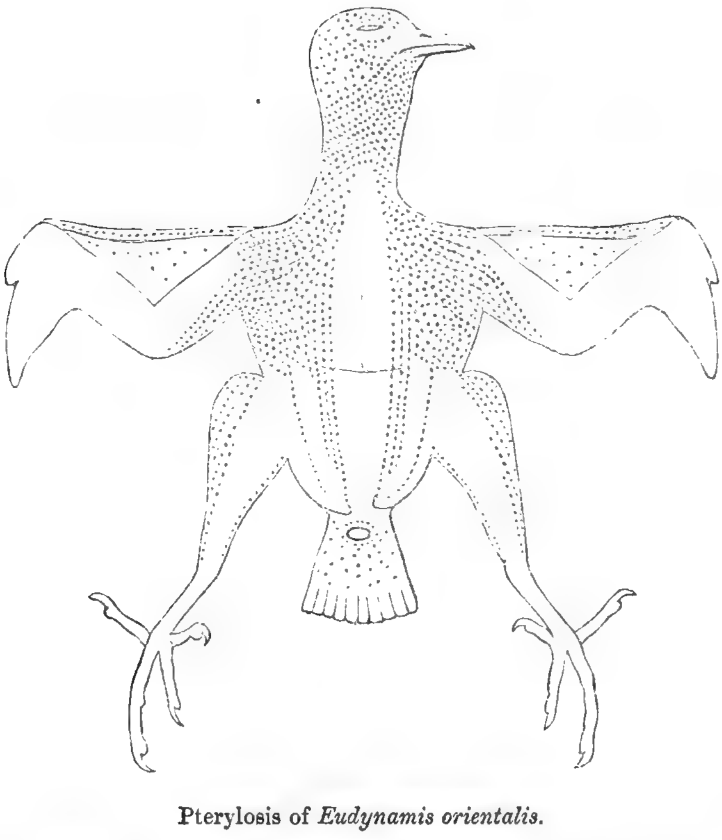
The pectoral tract of either side sends off a branch to the humeral tract, to the row of feathers which borders the patagial membrane in front and to the hypopteron; all these are separated by patches bare of feathers, or with merely one or two feathers scattered here and there.

Eudynamis orientalis.—This bird does not appear to me to agree so closely with *Cuculus* in its pterylosis as has been stated by Nitzsch; it differs in that each half of the ventral tract is bifid as in *Geococcyx*, &c.

The ventral tract at its commencement entirely occupies the space between the two rami of the mandible; on the breast the tract is very wide, and is continuous along the tract that separates the wing from the leg with the spinal tract, the axilla itself being alone devoid of feathers; some way below the axilla the tract divides into two branches, of which the outer one is only a single row of feathers; these are at first very closely approximated, but gradually become somewhat more widely separated. The outer branch of the ventral tract ceases to be distinguishable some way in front of the pubes. The inner branch is three feathers wide for nearly the whole of its extent; posteriorly it is only two feathers wide and terminates in front of the cloaca, but further back than the point at which the outer branch terminates.

The spinal tract is narrow on the neck but widens out considerably at the commencement of the trunk, where the feathering is less dense; at this point the spinal tract bifurcates to reunite a short way in front of the uropygium; each half of the spinal tract is of considerable width, and there is no break between the anterior

Fig. 6.



Pterylosis of *Eudynamis orientalis.*

and posterior section as is so commonly the case in other Cuckoos. Furthermore there is no such break between the spinal tract and the humeral tract as figured by Nitzsch in *Cuculus canorus*; the feathering is continuous from one to the other though sparse.

Rhinococcyx (*Phœnicophaes*) *curvirostris.*—This species is apparently synonymous with *Phœnicophaes viridirufus,* of which the pterylosis is described by Nitzsch. I am unable, however, to verify his description with the specimen before me. The ventral tract is widest on the breast and becomes narrower posteriorly; towards the posterior margin of the sternum each half divides again into two branches; just before the point of separation of these two branches, a row of feathers, at first wider, then narrowing to a single row, is given off to the hypopteron; the outer branch of the ventral tract is short and only consists of a single row of feathers; the inner branch is at first three feathers wide, then diminishes to two, and finally ends in a single row a little way in front of the cloaca.

The spinal tract is, as usual, closely feathered and bifurcates between the shoulder-blades; it is not connected by any feathering with the humeral tract, and is also separated by a more or less complete break from the remainder of the spinal tract.

The latter at its commencement is somewhat narrow on either side, and is not in any way connected with the ventral feathering; posteriorly it widens out and is continuous with the femoral tract. The femoral tract consists of about six rows of feathers parallel with each other, and almost at right angles with the long axis of the limb, separated by considerable intervals; rather behind the point of articulation of the femora with the pelvis, the two halves of the spinal tract unite.

It does not seem to me that Nitzsch has any grounds for separating, as he does, this genus of Cuckoos to form a separate group. *Phœnicophaes* is evidently closely allied to *Geococcyx*, *Guira*, &c., in its pterylosis.

The arrangement of the feather-tracts in an example of a species of *Centropus* from Celebes (see fig. 7, p. 184) seems to me to be rather different from Nitzsch's figure of *C. philippensis*[1].

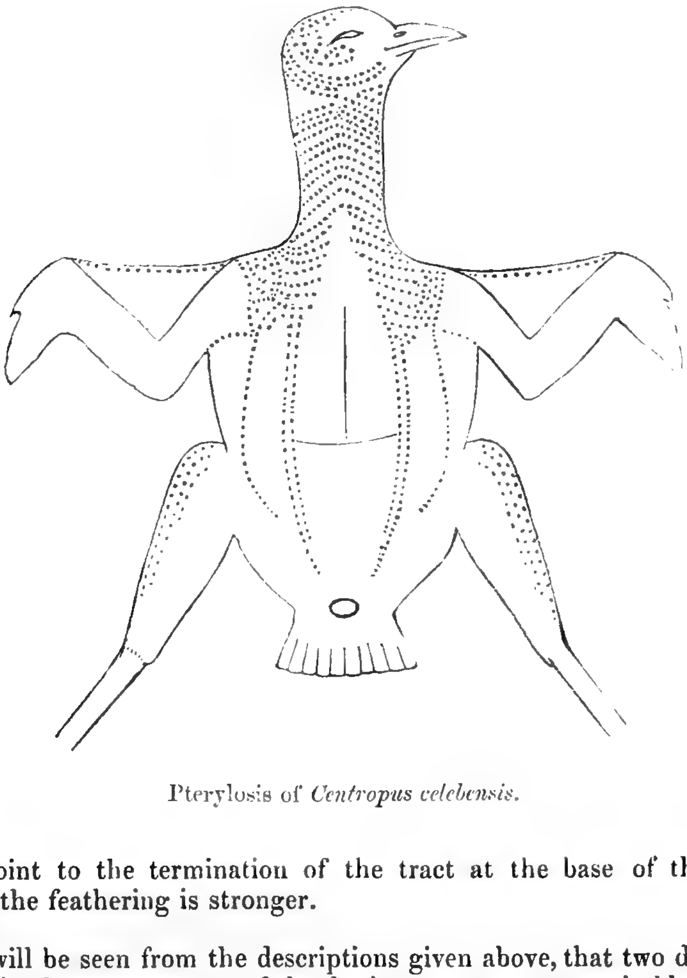
The ventral tract is particularly closely and strongly feathered in the region of the throat, where the rows of feathers form a series of chevrons, quite in a similar fashion to that which I have already described in *Cuculus*; the feathering, moreover, entirely fills up the space between the two rami of the mandible. On a level with the attachment of the humerus is given off the humeral tract, which is also strongly and closely feathered; it is about three feathers wide, and at its commencement gives off a branch which runs along the anterior margin of the patagium; the latter is not completely covered with feathers, which are distributed much as shown in the accompanying figure. Opposite the axilla the ventral tract of either side divides into two. The inner branch is at first two feathers wide, but just before its termination, a little way off the cloacal aperture, is reduced to a single row. The outer branch rapidly dwindles to a single row of feathers, and terminates some way in front of the inner branch, without, however, showing any signs of becoming fused with it. The ventral tract is therefore very different from that of *Centropus philippensis* as figured by Nitzsch (tab. et fig. cit.), where the two branches of either half of the tract are of equal breadth and reunite just in front of the cloaca.

The feathering on the head is continuous but rather scanty on the upper surface of the head. The spinal tract is very closely and strongly feathered, and is of a pyramidal form, gradually diminishing in breadth from before backwards; at about the level of the junction

[1] *Loc. cit.* pl. iv. figs. 13, 14.

of the scapula and coracoid the spinal tract seems to disappear altogether or is at most connected by a few scattered feathers with the rest of the tract, which as in other species is double, the two halves uniting together opposite to the attachment of the femur; from

Fig. 7.



Pterylosis of *Centropus celebensis*.

this point to the termination of the tract at the base of the oil-gland the feathering is stronger.

It will be seen from the descriptions given above, that two distinct types in the arrangement of the feather-tracts are recognizable:—

A. The pectoral tract of either side is single, narrowing gradually towards its termination as a single row of feathers a short way in front of the cloaca.

B. The pectoral tract of either side divides into two branches opposite the articulation of the humerus, which enclose no space but terminate separately, the inner branch further back than the outer.

Group A includes the genera *Cuculus, Cacomantis, Coccyzus, Piaya,* and *Saurothera,* which differ from each other more or less in detail, but agree in the main fact that the pectoral tract is single and not bifurcate. *Cacomantis* and *Cuculus* are in some respects different from the three other genera, as might indeed be expected from their different geographical range; they resemble each other in the peculiar arrangement of the ventral tract, which in its posterior portion at the end of the sternum is composed of three rows of feathers, of which the outer one, as shown in the accompanying drawing (fig. 3, p. 175), bends outward at some distance from the inner rows but approaches them before its termination. The three American genera *Piaya, Saurothera,* and *Coccyzus* agree to differ from the Old-World representatives of this group, in that the ventral tract is double from the point of origin at the mandibular symphysis; in *Cuculus* and *Cacomantis* the commencement of the ventral tract occupies the whole, or nearly the whole, of the area lying between the two mandibular rami, and is single.

Group B includes the genera *Centropus, Pyrrhocentor, Geococcyx, Guira, Crotophaga, Phœnicophaes* (*Rhinococcyx*), and *Eudynamis.*

Phœnicophaes, although regarded by Nitzsch as differing in important particulars from *Centropus* and *Eudynamis,* does not appear to me to display any such peculiarities in its pterylosis as would necessitate a further division of this group; it has been stated, however, that both *Phœnicophaes* and *Eudynamis,* although agreeing with the other genera of this group in their pterylosis, resemble *Cuculus* in possessing a tracheo-bronchial syrinx, and on this account should be placed apart.

The remaining genera of this group may be arranged in two divisions:—

(1) *Crotophaga, Guira,* and *Geococcyx,* where the ventral tract is narrow at its commencement, and only occupies the median portion of the intermandibular area.

(2) *Centropus* and *Pyrrhocentor,* where the ventral tract at its commencement occupies the whole of the space between the rami of the mandibles.

It will be observed that this arrangement conveniently separates the New-World from the Old-World genera, though the distinction is undoubtedly a very small one; perhaps the resemblance between *Geoccocyx* and *Centropus* in the matter of the syrinx should be made more account of, and these genera separated from *Crotophaga* and *Guira.* Recalling the structure of the syrinx in the several genera, it will be apparent that group A is also distinguishable from group B by means of the structure of this organ. In all the genera which I have associated together in the former of these two groups, the syrinx is tracheo-bronchial; in Group B, with the exception of the genera *Eudynamis* and *Phœnicophaes,* the syrinx is bronchial, though by no means constructed on exactly the same type in the different genera; in *Crotophaga* and *Guira* the syrinx is purely bronchial, inasmuch as the anterior rings of the bronchi are complete, and the membrana tympaniformis does not therefore extend up to the last tracheal ring; and there can be no pessulus, and the tracheal rings therefore take no share in the formation of the voice-organ. In *Geococcyx, Centropus, Pyrrhocentor*, and *Coua*[1] the syrinx is somewhat intermediate between the bronchial and the tracheo-bronchial, but on the whole appears to me to present more resemblances to the former.

The continuation of the membrana tympaniformis up to the bifurcation of the bronchi, and the presence of a well-marked pessulus undoubtedly are points which characterize the tracheo-bronchial syrinx; on the other hand, the extreme narrowness of the membrana tympaniformis in the anterior half of each bronchus, and its sudden widening out at that bronchial semiring upon which the intrinsic muscles of the syrinx are attached, indicates that the syrinx of these genera is only separated by a very small interval from the bronchial syrinx of *Crotophaga*.

A complete closure of the already very narrow interval separating the inner ends of the anterior bronchial semirings would bring about a syrinx entirely indistinguishable from that of *Crotophaga*; in the ordinary tracheo-bronchial syrinx the membrana tympaniformis is widest anteriorly, and, if anything, diminishes posteriorly.

Guira and *Crotophaga* further present an agreement with each other in having eight rectrices instead of the ten which characterize all the other genera of the family known to me[2].

The tracheo-bronchial syrinx of *Eudynamis* and *Phœnicophaes*, combined with the Centropine characters exhibited in the pterylosis, appear to me to necessitate their separation both from the Cuculine and the Centropine forms. The muscle-formula of these two genera (see p. 170) is complete; and so far they agree with the Centropine and differ from the Cuculine genera; they should perhaps form a third subfamily equivalent to either of the other two.

The following table of classification will serve at least as an abstract of the facts contained in the present paper, and of the conclusions respecting the mutual affinities of the different genera, to be derived from a study of these facts. I do not of course pretend that as a system of classification it will be permanent; but it may at any rate be an assistance towards a proper classification, which can only be drawn up when all the genera have been thoroughly studied.

[1] I have not myself examined *Coua*, but I possess sketches of its syrinx drawn by Mr. Garrod from specimens lent to him by M. A. Milne-Edwards. It is but fair to my predecessor to mention also, that several of the other syringes described in the present paper have been carefully drawn by him. The woodcuts which illustrate this paper are not, however, copied from Mr. Garrod's sketches, which only came into my hands after the woodcuts had been already drawn by Mr. Smit.

[2] Mr. Sclater particularly associates these two genera in his 'Catalogue of American Birds,' p. 320.

Family CUCULIDÆ.

Subfamily I. *Cuculinæ*. Syrinx tracheo-bronchial; pterylosis, ventral tract of both sides single. Muscle-formula A X Y+.

a. Ventral tract single at its commencement.

Genera *Cuculus*.
Chrysococcyx.
Cacomantis.
Coccystes (?).
} Old World.

b. Ventral tract double at its commencement.

Genera *Saurothera*.
Diplopterus(?).
Piaya.
Coccyzus.
} New World.

Subfamily II. *Phœnicophainæ*. Syrinx tracheo-bronchial; pterylosis, ventral tract of both sides bifurcate. Muscle-formula A B X Y+.

Genera *Eudynamis*.
Phœnicophaes.
} Old World.

Subfamily III. *Centropodinæ*. Syrinx bronchial; pterylosis, ventral tract of both sides bifurcate; muscle-formula A B X Y+.

a. Ventral tract occupying whole of space between mandibles.

Genera *Pyrrhocentor*.
Centropus.
Coua (?).
} Old World.

b. Ventral tract only occupying median portion of space between mandibles.

Genera *Geococcyx*.
Crotophaga.
Guira.
} New World.

2. On the Heart of *Apteryx*. By F. E. Beddard, M.A., F.R.S.E., Prosector to the Society.

[Received February 17, 1885.]

The structure of the heart of *Apteryx* has been described somewhat fully by Sir Richard Owen in his well-known memoir upon the anatomy of the Southern Apteryx[1]; this account is illustrated by two figures, one of which represents the heart in its entirety viewed from the right side, while the other is a view of the same region of the heart, with the wall of the right ventricle removed in order to display the structure of the right auriculo-ventricular valve.

The description given of the right auriculo-ventricular valve is as follows:—

"The principal deviation from the ornithic type of the structure of the heart is represented in the valve at the entry into the right ventricle (pl. lii. fig. 3). This is characterized in birds by its muscularity and its free semilunar margin. In the *Apteryx* it is relatively thinner and in some parts semitransparent and nearly membranous; a process moreover extends from the middle of its free margin, which process is attached by two or three short *chordæ tendineæ* to the angle between the free and fixed *parietes* of the ventricle. We perceive in this mode of connection an approach in the present bird to the mammalian type of structure analogous to that which the *Ornithorhynchus*, among Mammalia, offers, in the structure of the same part, to the class of birds; for the right auriculo-ventricular valve in the *Ornithorhynchus* is partly fleshy and partly membranous."

The figure which illustrates this description is entirely in harmony with it, but does not at all represent the structures observable in the hearts of *Apteryx* that I have myself studied.

In a heart of *Apteryx australis*, which I found among the Prosector's stores, the right-auriculo-ventricular valve is composed of two halves which unite together at a point nearly opposite the auriculo-ventricular aperture, and are connected there by a muscular flap to the dorsal (free) wall of the ventricle. The right half is the larger and arises chiefly from the free wall of the ventricle, partly, however, from the septum and from the point of union of the septum with the free wall; it is of uniform thickness and muscular throughout. The left half of the valve is considerably smaller; it arises from the inter-ventricular septum and from the septum between the ventricle and the auricle; like the right valve, it is muscular throughout with the exception of a very minute membranous portion lying at the lower side of the valve; this portion of the auriculo-ventricular valve is not of uniform appearance like the left, but is formed

[1] Trans. Zool. Soc. vol. ii. p. 272.

of a number of closely united fleshy columns. Just before the junction of the left half of the valve with the muscular flap already described two minute *chordæ tendineæ* connect it with the free wall of the ventricle between the attachments of the left half of the valve and the free muscular flap; the two are fused almost immediately after their origin, and form a single excessively small fibrous band which is attached to a papillary muscle.

I can find no trace of the *chordæ tendineæ* that Sir R. Owen figures arising from the lower margin of the valve and inserted towards the hinder end of the ventricular cavity; the only structure at all similar is the slender fibrous band which I have described as connecting the valve with the free wall of the ventricle; this structure does not appear to me to be the same for reasons which I shall put forward in describing the heart of *Apteryx oweni*. With regard to the valve itself, it is not in my specimen "in some parts semitransparent and nearly membranous;" the thickness of the valve, which, except for a small portion on the left half is entirely muscular, is by no means less than that of any other bird with which I have had the opportunity of comparing it; the very slight development of membrane on the left half of the valve close to its origin is clearly a matter of no importance, since I have found this same feature to be more marked in *Eupodotis* and in other birds. In short, my heart of *Apteryx*, as well as a specimen in the possession of Prof. Lankester, which he kindly allowed me to inspect, and another preserved in the Oxford Museum, *present no differences of any importance from the hearts of other birds.*

Of the heart of *Apteryx oweni* I have been able to examine two examples, in both of which the right auriculo-ventricular valve has much the same structure. It only differs from that of *A. australis* in the presence of a stout muscular band arising from the septal wall of the ventricle and attached to its free wall close to the fleshy bridge which unites the free margin of the valve to the ventricular wall; it gives off a short branch to the latter. This structure closely corresponds to the "moderator band" described by Prof. Rolleston in the heart of the Cassowary; the *chordæ tendineæ* which I have described in the heart of *A. australis* probably represent the upper portion of the moderator band of *A. oweni*.

I have examined a large series of hearts of birds with a view to discovering if there were any deviations from the normal type in the right auriculo-ventricular valve, but I can find none; the only differences at all are in the left-hand portion of the valve, which is more or less membranous, and in a specimen of *Eupodotis australis* appears to be entirely so. Gegenbaur, however, speaks of a rudimentary septal flap in *Sarcorhamphus* [1].

[1] Jen. Zeitschr. Bd. ii. p. 380.

3. Descriptions of the Phytophagous Coleoptera of Japan, obtained by Mr. George Lewis during his Second Journey, from February 1880 to September 1881.—Part I. By MARTIN JACOBY.

[Received February 2, 1885.]

(Plate XI.)

Our knowledge of the Coleopterous fauna of Japan has during late years greatly increased, on account of many entomologists having visited this country, and the collections which they obtained having been well worked out by specialists. We have valuable monographs and descriptions by Mr. Bates, v. Harold, v. Kiesenwetter, Kraatz, Baly, and others; yet, in spite of the considerable material already obtained, each new collection sent home from Japan seems to prove that many years must yet elapse before we can hope to be thoroughly acquainted with its Coleopterous fauna, since so many new species are continually discovered.

Mr. Bates, in his paper on the Geodephagous Coleoptera obtained by Mr. Lewis during his second journey, has added no less than 118 new species as well as many others not previously known from Japan. To his remarks in regard to this journey as well as to the map accompanying his descriptions, and giving particulars as to Mr. Lewis's route (Trans. Ent. Soc. 1883, iii.), I must here refer.

The Phytophagous Coleoptera of this collection contain, besides those already obtained during Mr. Lewis's first visit to Japan, and described by Mr. Baly, many new forms or species as well as a genus (*Hæmonia*) not formerly recorded from Japan. Here, as in other groups, the relations of Japan to other countries seems to move in the same proportions; that is, we find identical genera and species which are known either from Siberia, India, and China or the Malayan regions, while a certain amount remains proper to Japan.

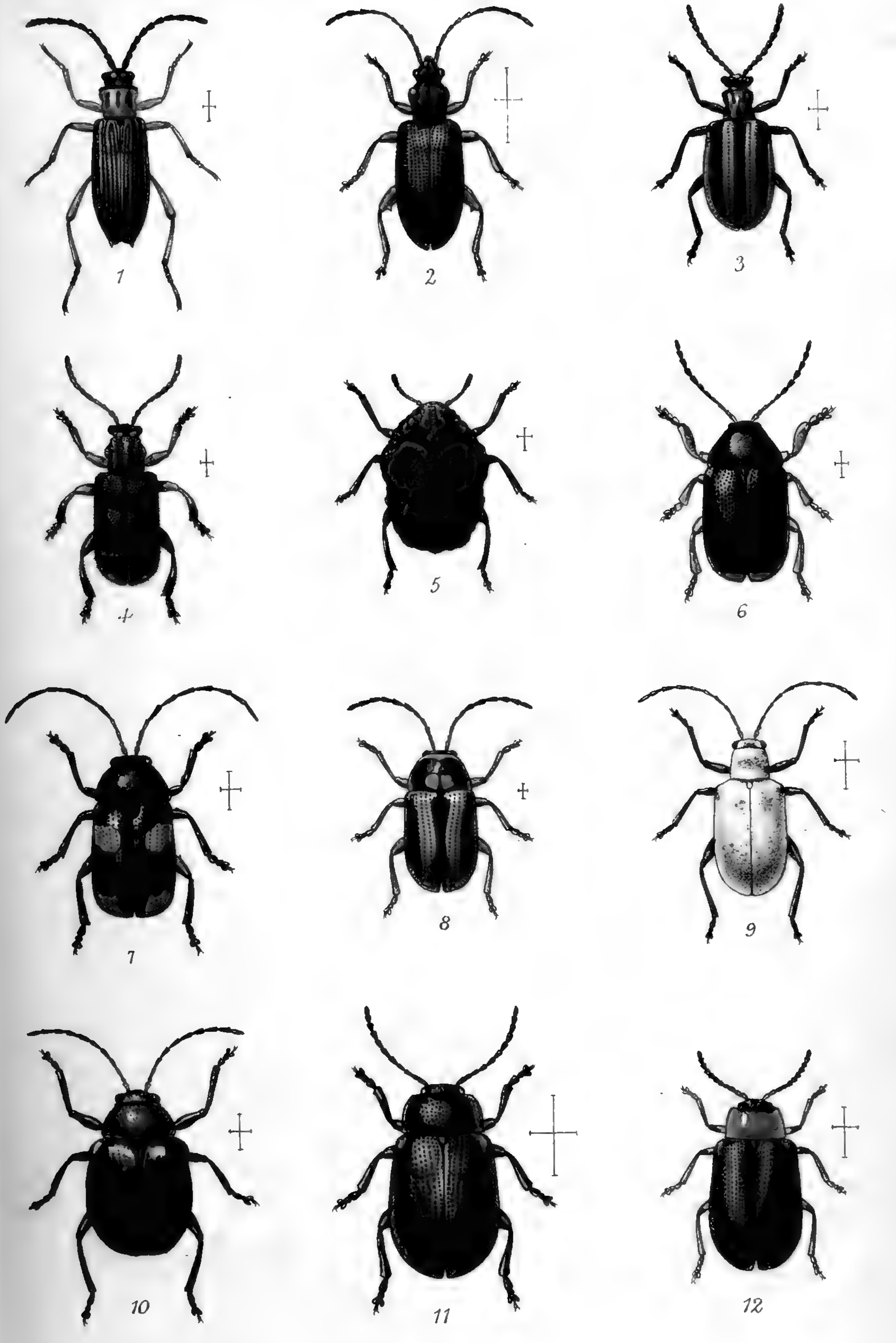
The occurrence in the latter country of such genera as *Chlamys* and *Lamprosoma*, which are almost exclusively confined to South America (of *Chlamys* only 3 species have been described, from India and Malaya, of *Lamprosoma* a single one from Formosa), is certainly interesting; amongst the Phytophaga, however, the greater preponderance seems to be given to Siberian forms as far as we are able to judge at present.

The present paper deals with those genera included to the end of the Chrysomelidæ, while the Halticinæ and Galerucinæ will form the subject of a second communication.

Genus HÆMONIA, Latr.

HÆMONIA JAPANA, n. sp. (Plate XI. fig. 1.)

Below black; above testaceous; head, antennæ, anterior margin, and three longitudinal lines on the thorax black; elytra with five



W. Purkiss lith. Hanhart imp.

PHYTOPHAGOUS COLEOPTERA FROM JAPAN.

double rows of black punctures, their apex produced in a spine; apex of the femora, tibiæ, and tarsi spotted with black.

Length 2 lines.

Head deeply triangularly grooved between the eyes. Antennæ half the length of the body, black; the second and third joints short, of equal length, fourth slightly longer, the two terminal joints slender and the longest. Thorax subquadrate, nearly as long as broad, the sides straight or slightly concave from before the middle to the base, anterior and posterior margins nearly straight, the space immediately behind the former thickened; surface impunctate, the anterior margin and three deeply impressed longitudinal grooves on the disk black; of these, the central one is straight and does not extend to the base, the lateral are oblique and extend to the posterior angles; a few punctures are also seen in front of the base. Scutellum elongate, black, covered with fine silky pubescence. Elytra slightly depressed below the base, the intervals between the five black double rows of punctures raised, and as broad as the space between each two single rows; the apex of each elytron truncate and produced at the outer angle in a long testaceous spine; posterior first tarsal joint as long as the two following ones united; each joint as well as the extreme apex of the tibiæ and femora spotted with black; the very long claw-joint also stained with piceous at its apex.

Bukenji, April; in a pond.

The single specimen obtained by Mr. Lewis of this interesting little *Hæmonia* will enter Lacordaire's second division on account of the long first tarsal joint, and the short and equal second and third joints of the antennæ. The insect is well distinguished by the shining, not opaque thorax, and by the addition of the central black groove on the disk of the latter. By this last character it may be at once separated from *H. equiseti*, to which it seems otherwise closely allied.

Genus Donacia, Fabr.

Donacia gracilipes, sp. nov.

Elongate, depressed above, narrowed behind, of a metallic bronze colour; below covered with silvery pubescence. Thorax square-shaped, covered with fine transverse strigæ; elytra obliquely depressed below the base, strongly punctate-striate, the interstices transversely wrinkled throughout; posterior femora with a short tooth.

Length 3–4½ lines.

Head less shining, covered with fine pubescence, the space above the antennæ raised in shape of two more or less distinct tubercles; vertex without longitudinal groove. Antennæ nearly as long as the body, the basal joint metallic, the rest black; the third and the two following joints of equal length, double as long as the second (in some specimens the fourth joint is slightly longer than the preceding). Thorax square-shaped, the sides constricted near the base, moderately thickened into a kind of callosity near the anterior angles, these latter with a short pointed tubercle, furnished with a single hair; surface closely, irregularly, and finely transversely wrinkled or rugose throughout; another similar tubercle like the anterior one, also furnished with a single seta, is placed at the posterior angles. Scutellum triangular, pubescent. Elytra distinctly narrowed behind, truncate at the apex, their surface flattened, with a generally distinct oblique depression from the shoulder to the suture, strongly punctate-striate to the apex; the interstices everywhere transversely wrinkled, but more strongly so towards the base. Legs slender, the posterior femora not quite extending to the apex of the elytra and furnished with a short acute tooth.

The female is often much larger and especially broader, being sometimes of double the width of the male, and proportionally more robust; the elytra are also more strongly wrinkled as well as the thorax, and the antennæ slightly shorter.

Junsai.

Of this species many specimens were obtained living on a kind of water-lily, and although closely allied to several European and North-American forms, I am unable to identify it with any of them. The nearest allied amongst the European Donacias seems to be *D. aquatica*, L. This species is, however, broader, less elongate and narrowed behind, the colour of the elytra is quite different, and their punctuation much finer and less deep; the basilar oblique depression is also much less distinct. The thirteen specimens before me of *D. gracilipes* show no variation whatever except in size, and the species may be principally known by the nearly square-shaped thorax, and its short, but acutely produced anterior and (to a less extent) posterior angles in connection with the oblique anterior elytral depression, and the slender third and fourth joints of the antennæ.

DONACIA CONSTRICTICOLLIS, sp. nov. (Plate XI. fig. 2.)

Robust, convex, obscure cupreous or brownish æneous; antennæ and legs ferruginous; thorax much narrowed behind, shining and finely punctured; elytra with a basilar depression, strongly punctate-striate; the interstices transversely wrinkled; posterior femora with a broad tooth.

Length 4–$4\frac{3}{4}$ lines.

Head closely pubescent, with a central impressed longitudinal line. Labrum and jaws fulvous. Third and fourth joints of the antennæ equal; the three or four terminal ones fuscous or stained at their extremities only with that colour. Thorax longer than broad, greatly narrowed near the base; the sides near the anterior angles strongly produced into a broad callus, below the latter less swollen; surface covered with fine punctures, which are a little more closely placed and slightly confluent in the female near the anterior and posterior margin; the latter with a shallow transverse groove; rest of the surface smooth and very shining. Apex of the elytra rounded. Femora robust, the posterior ones dilated into a broad triangular tooth. Abdomen tinged with rufous.

Lake at Junsai.

I can only compare this species with *D. sulcicollis*, from North America, to which it is certainly closely allied. The thorax is, however, much more narrowed behind than in that species and the anterior callosities are much more developed; another difference is to be found in the more elongate joints of the antennæ and their comparative different length. *D. discolor*, Hoppe, may be at once distinguished from the present insect by the more opaque and confluently punctured thorax; the latter in *D. constricticollis* having a highly polished appearance.

Donacia sericea, L., var. sibirica? Solsky.

The dozen specimens obtained at Nikko show scarcely any difference from our European form; but may very well be referred to Solsky's variety according to the description given by this author. In colour the specimens vary from reddish cupreous to green or æneous like the European *D. sericea*. Structural differences I can see none.

Donacia simplex, Fab.

Of this species Mr. Lewis obtained nine specimens at a pond at Hakodate. They also, like the preceding species, do not differ from the European form in any way whatever, and vary in size like it; *D. simplex* has also been recorded from Siberia.

Genus Syneta, Eschsch.

Syneta adamsi, Baly.

Of this species, of which I have the type for comparison, several specimens were obtained by Mr. Lewis which agree very nearly with the latter; but a number of others, partly from the same locality, seem at first sight certainly to represent a different species; and I have hesitated long before I came to a conclusive opinion in regard to their specific value. The very many intermediate forms, however, of which scarcely two are of the same size, sculpturing, and colour, which are before me, prove the insect to be an extremely variable one. On the same principle I am very much inclined to believe that those species described by LeConte from America, established principally on colour and more or less distinctly visible elytral costæ, may eventually prove to belong to one species only. At all events, the specimens collected by Mr. Lewis defy a satisfactory separation: in some the thorax is much more elongate than is the case in *S. adamsi*, but intermediate stages are not wanting; in others two very distinct costæ are visible, these dwindling away again to the form with one distinct lateral costa only, as described by Baly. The thorax in all of them is like that of the type, angulate at the middle, the angle itself generally 3-dentate, in some specimens the intermediate tooth being only distinct, the others obsolete. The following are the varieties with their localities:—

Var. a. Head and thorax as well as the terminal joints of the antennæ fuscous or black; elytra with a sutural and lateral broad longitudinal fuscous band. (Niohozan, Kiga, on birch.)

Var. b. Elytra and antennæ fulvous; the suture and a narrow lateral stripe fuscous; the costæ, with the exception of the fourth indistinct; rest as in Var. *a*. (Nikko, Miya, Kiga.)

Var. c. Larger, the elytra more smoothly punctured, without any costæ; testaceous, thorax stained with fuscous. (Nikaido.)

From the above localities specimens agreeing with the type in colour and structure were also obtained; between this and the above varieties some more intermediate stages in colour and sculpture are present, and it will be seen that Mr. Baly drew his descriptions from unicolorous fulvous specimens; the same author describes the thorax as transverse, with which some specimens (♀) agree; in the males the thorax is, however, much longer although agreeing in every other respect; but I have no doubt that all belong to one species. The specimens vary in size from 2–4 lines.

Genus Lema, Fabr.

Lema adamsi, Baly.

A variety of this species, obtained at Yuyama, differs from the typical form in having the elytral spots joined in shape of a longitudinal broad band which occupies nearly the entire disk, leaving only the sutural and lateral margin fulvous; the tibiæ and tarsi are also entirely black; in other respects there is no difference. I may further remark that the specimens contained in the collection of Mr. Lewis, as well as the variety described here, have the *first* joint of the antennæ fulvous only, not the two first as mentioned by Mr. Baly.

Lema dilecta, Baly.

All the specimens before me, obtained at Ogura Lake and Kioto, have black legs, with the exception of the base of the tibiæ, which is fulvous; in the type the legs are entirely of that colour; but I can find no other differences whatever.

Genus Crioceris, Geoffr.

Crioceris lewisi, n. sp. (Plate XI. fig. 3.)

Oblong, parallel, subdepressed, black; thorax fulvous, impunctate, three spots on the disk and one at each side black; elytra fulvous, deeply punctate-striate; the interstices partially costate, the suture and a longitudinal band on each elytron black.

Length $2\frac{1}{4}$ lines.

Head deeply constricted behind the eyes, with a deep longitudinal groove between the eyes, the latter large and very prominent; orbital grooves distinct, the space between it and the eyes thinly covered with yellow pubescence as well as the lower part of the face. Antennæ more than half the length of the body, black; the three or four lower joints shining, the rest covered with close pubescence, dilated; the second to the fourth joints gradually elongate. Thorax subquadrate, moderately constricted at the middle, without a basilar groove, fulvous; three elongate spots placed triangularly on the disk and a long narrow band at the sides black; surface impunctate, a few punctures only are placed near the sides. Scutellum black. Elytra much wider at the base than the thorax, subquadrate-oblong, the punctured striæ arranged in the following way:—a double row placed close to the sutural margin, the following space broader than that occupied by the punctures and raised in a costa near the apex; the eight following rows of punctures regularly placed, but the first and the last three of these very deeply impressed; the interspace in front of the last two rows costate; the black sutural band extends to the first row of punctures, the discoidal band occupies the space between the third and eighth rows, both bands are connected with a small triangular black spot at the apex. Underside and legs are entirely black.

Nikko. A single specimen.

Crioceris orientalis, sp. nov.

Below, the lower part of the head, a spot at the vertex, antennæ, and legs black; thorax cylindrical, fulvous; elytra testaceous, distinctly punctate-striate.

Length $2\frac{1}{2}$ lines.

Head impunctate, black, sparingly covered with yellow pubescence; vertex fulvous, with an elongate blackish central spot. Antennæ half the length of the body, black, the second joint extremely short. Thorax cylindrical, scarcely constricted at the middle, with a narrow transverse groove close to the basal margin; surface remotely and very finely punctured, fulvous, the sides below black. Scutellum black. Elytra convex, of paler colour than the thorax, regularly and rather strongly punctate-striate, the punctuation getting finer towards the apex; at the shoulder a small piceous spot is visible. Underside and legs black.

Sapparo.

Of this species only a single specimen is before me, which in structure is without doubt closely allied to *C. 12-punctata* and several others, in which the thorax is nearly cylindrical. The absence of any spots at the disk of the elytra and the general colour of the present species will help to distinguish it.

Genus Pedrillia, Westw.

Pedrillia annulata, Baly.

In all the specimens which were obtained at Nikko the black spot of the head and thorax as described by Mr. Baly is wanting, but in every other respect the insects agree.

Pedrillia nigricollis, n. sp.

Black, pubescent; elytra testaceous, closely punctured.

Length 2 lines.

Head strongly punctured in front of the eyes, the intermediate space and the vertex smooth and shining; eyes deeply notched; the space in front of the clypeus deeply foveolate. Antennæ half the length of the body, black, the third and fourth joints equal, the rest shorter, somewhat trigonately shaped. Thorax scarcely broader than long, the sides before the middle produced in a rounded prominence; another less strongly marked protuberance is placed close to the posterior margins at the sides; surface convex at the anterior portion, the latter divided by a short longitudinal groove; disk strongly but not very closely punctured and covered with rather long yellow pubescence. Elytra subdepressed anteriorly, nearly parallel, more strongly punctured than the thorax, and pubescent like the latter. Legs black, covered with yellow hairs; posterior tibæ curved.

Wada toge (August); Fukushima (July).

I am somewhat in doubt whether this species is not the normally coloured form of *T. bicolor*, Kraatz, to which at all events it is very closely allied; the differences consist in the entirely *black* thorax and abdomen, and perhaps in the less closely rugose-punctate head of the present species. Kraatz drew his description from a single specimen, which had the posterior margin of the thorax *yellow* as well as the abdomen; but as in the five specimens before me I cannot discover any trace of this colour, I must consider the species as specifically distinct. I may further add that the latter is *not* more robust or broader in shape than *P. annulata*, which is the case with *P. bicolor* according to the description, and that the legs in some specimens (probably immature) are obscure fulvous.

Pedrillia varipes, n. sp.

Below, the posterior legs, and the antennæ (the two basal joints excepted) black; above, the anterior legs, and the tarsi fulvous; elytra and thorax closely punctured, finely pubescent.

Var. Head and thorax black.

Length $1\frac{3}{4}$ line.

Head distinctly but remotely punctured, with a narrow longitudinal smooth central space; that between the antennæ with a deep transverse groove; two lower joints of the antennæ fulvous, the rest black, fourth joint distinctly longer than the third, the following joints short and somewhat triangular-shaped. Thorax nearly as long as broad, the sides produced at or immediately before the middle in a distinct angle, behind which a short but deep transverse groove is placed, only visible from below; entire surface covered with deep and rather closely placed punctures, sparingly pubescent. Elytra parallel and subcylindrical, punctured and pubescent like the thorax, but of a rather lighter fulvous or testaceous colour; the space behind the middle is very slightly depressed; the four posterior legs piceous or black; anterior ones and the tarsi fulvous.

Nikko, June; Chiuzenzi.

Smaller and less robust than *P. nigricollis*, the thorax more coarsely and more distantly punctured, and the anterior legs as well as all the tarsi fulvous. A single specimen of the variety with black head and thorax is before me, but I cannot find any other characters sufficient to separate this form as another species.

Pedrillia unifasciata, n. sp. (Plate XI. fig. 4.)

Black, pubescent; antennæ and legs testaceous; a spot at the anterior femora, the apex of the tibiæ, and the tarsi and the posterior femora black; thorax closely punctured with three obscure fulvous bands; elytra with the shoulders, a spot at the apex, and a transverse band near the latter fulvous.

Length $1\frac{1}{2}$ line.

Head deeply and very closely punctured, the sides of the neck, lower part of the face, and palpi testaceous; the first two joints of the antennæ stained with piceous above, the third and fourth joints of equal length. Thorax rather long, the sides strongly produced before the middle in a rounded protuberance, constricted immediately below the latter; surface closely punctured like the head and covered with rather long fulvous hairs; the sides, a longitudinal band near the latter, and a much more obscure vitta on the disk fulvous or testaceous. Scutellum thickly covere d with silky yellow pubescence. Elytra convex and parallel, slightly depressed behind the middle, punctured like the thorax but the punctuation much more distantly placed; an elongate fulvous spot surrounds the shoulder, a round spot is placed close to the apex at the sides, and a transverse band of irregular shape at a little distance from the apex; the tibiæ and tarsi are also closely covered with fulvous hairs; a piceous spot is placed on the middle of the four anterior femora, the posterior ones, together with the apices of all the tibiæ and the tarsi, being entirely of that colour; the first two abdominal segments have a large fulvous spot at the sides, the rest are black.

Nikko. A single specimen.

Genus Oomorphus, Curtis.

Oomorphus japanus, sp. nov.

Ovate, convex, narrowed behind, below black, above brownish æneous; thorax closely and finely punctured; elytra more strongly, closely punctate-striate.

Length 1 line.

Head very finely punctured, transversely grooved between the eyes, the middle of the front sometimes with an obsolete longitudinal groove. Antennæ black, the second joint larger and broader than the four following, the seventh transversely dilated, the eighth very short, the terminal three joints transverse, forming a club. Thorax narrowed in front, twice as broad as long, the sides but slightly rounded; surface closely, evenly, and finely punctured. Elytra distinctly narrowed behind, more strongly punctured than the thorax, the punctuation arranged alternately in stronger and finer rows of punctures, distinct to the apex. Underside black; the breast, domen, and legs more or less stained with brownish cupreous.

Oyama, Jschiuchi.

Smaller and more narrowed behind than our *O. concolor*, of a bronze not black colour, and the interstices between the larger rows of punctures less finely punctured, the larger rows also much more closely placed. *Lamprosoma cupreatum*, Baly, is of double the size and quite differently punctured, also less narrowed behind. Nearly a dozen specimens were obtained.

LAMPROSOMA CUPREATUM, Baly.

Nearly all the specimens in this collection which I refer to Mr. Baly's species are smaller, more attenuated behind, and varying in the degree of their punctuation and colour. In the absence of other characters I have refrained from describing them as new, and believe that they only represent a local variety.

Genus CHLAMYS, Knoch.

CHLAMYS JAPONICA, n. sp. (Plate XI. fig. 5.)

Subquadrate-ovate, obscure piceous; head more or less fulvous; thorax with a posterior elevation, closely punctured and covered with fulvous tubercles; elytra strongly punctured, with a strongly raised oblique ridge from the middle of the base to the suture, and divided by other transverse irregular ridges; legs obscure fulvous.

Length $1\frac{1}{2}$–$1\frac{3}{4}$ line.

Head closely rugose-punctate, rather flattened, light or darker fulvous. Antennæ of the same colour, the fifth and following joints transversely widened, third and fourth joints of equal length. Thorax with the middle portion gradually raised posteriorly in a moderate but distinct gibbosity, the apex of which is slightly longitudinally depressed, and the sides obliquely and rather deeply grooved or constricted: the swollen portion of the thorax, as well as the more flattened sides, are covered with irregular flavous or fulvous tuberosities, the interstices of which are closely punctured. Scutellum greatly transversely dilated posteriorly, the lateral angles acute and produced, and its posterior margin concave. Elytra slightly narrowed towards the apex, the sides rather strongly constricted at the middle; surface covered with deeper and much larger punctuation than that of the thorax; when viewed sideways the following longitudinal ridges are seen:—a narrow one from the middle of the base runs in an oblique direction towards the suture near the apex; the anterior portion of this ridge is narrow and acute to the middle, where it is intersected by a transverse ridge which runs from the shoulder to the suture; the portion of the ridge from the middle to the place where it touches the suture is broader and very strongly raised, which makes the space enclosed by it appear as being excavated; near the apex three more strongly raised tubercles placed triangularly are seen; a short transverse ridge is further visible at the sides within the constricted space; the suture itself is distinctly denticulate through its entire length. Pygidium closely punctured, with three obsolete longitudinal costæ.

Kiga, Fukushima.

The raised parts of the thorax and the elytra in this species are frequently of a flavous or fulvous colour, which sometimes is that of the entire head and thorax. The species is closely allied to *C.*

spilota, Baly, but differs in its less elongate and more square shape and in the differently sculptured elytra; the latter show immediately below the middle, near the suture, an apparently deeply excavated space, caused partly by the strongly raised principal ridge, which limits this space laterally: the *anterior* portion of the elytra within the ridge only shows a few very small tubercles near the suture; in *C. spilota* there is a distinct tubercle in the corresponding portion; the elevate ridges are but slightly raised and the excavated space below the middle is wanting.

CHLAMYS SPILOTA, Baly.

Of this species, a variety obtained at Miyanoshito is of nearly entirely fulvous colour, the thorax being transversely spotted with black. *C. spilota* may be separated from other allied forms principally by the gibbous or posteriorly elevated shape of the thorax; this elevation or bump is somewhat conically shaped and is *not* divided at the middle by a longitudinal channel, so frequently the case in other species, although the *apex* of the tuberosity is faintly sulcate. Another normally coloured specimen of this species was obtained at Nakone.

Genus CRYPTOCEPHALUS, Geoffr.

CRYPTOCEPHALUS LIMBATIPENNIS, n. sp.

Black: clypeus, anterior and lateral margin of the thorax and two basal spots of the latter yellow; basal joints of antennæ and the legs fulvous; thorax rugose-punctate at the sides; elytra strongly punctate-striate, black, the lateral margins narrowly flavous.

Length $1\frac{1}{2}$ line.

Head closely and distinctly punctured, black; the clypeus, labrum, and part of the sides below the eyes flavous; antennæ black, the five basal joints fulvous, fourth joint slightly longer than the third. Thorax about twice as broad as long, the sides nearly straight, produced in a point at the posterior angles; surface closely covered with distinct and somewhat elongate punctures, confluent and forming elongate and deep strigæ at the sides, the anterior and lateral margins narrow, yellow, the former with a slight indentation at the middle, which intrudes into the black-coloured portion; at the base, immediately above the scutellum, two closely approached fulvous spots are placed. Scutellum elongate, raised behind. Elytra with regular rows of deep and not very closely approached punctures, which get less deep below the middle but are distinct to the apex, the latter of which is covered closely with other fine punctures; interspaces at the sides below the shoulder here and there somewhat transversely wrinkled; humeral callus very prominent, the extreme base impunctate; the colour of the disk entirely black, the lateral margin narrowly flavous, this colour is slightly widened at a place near and below the middle. Pygidium black, margined with yellow. Legs entirely fulvous.

Shimonosuwa (Suwa Lake).

There is only a single specimen of this species before me, which seems to be closely allied to *C. limbellus*, Mannerh., or rather to its black variety, which is almost identical in its coloration; but the sculpture of the thorax in *C. limbatipennis* is quite distinct from the allied and other similarly coloured species, forming elongate confluent rugosities at the sides, which will prevent the insect being mistaken for any of the allied forms.

Cryptocephalus partitus, n. sp. (Plate XI. fig. 8.)

Cylindrical, convex; black; base of antennæ and the legs fulvous; anterior and lateral margins of the thorax and two spots at the base yellow; surface finely strigose; elytra regularly punctate-striate, yellow, a sutural and discoidal longitudinal band black.

Length 1 line.

Head flat, yellow, the extreme base and a short longitudinal central band, connected with the latter, black; antennæ nearly as long as the body, the five lower joints fulvous, the rest black, third and fourth joints equal. Thorax rather transverse, the sides very little rounded; surface entirely covered with very fine confluent longitudinal strigæ, black; the anterior and lateral margins (the former slightly widened at the middle), and two large, closely-approached transverse spots, placed at the middle of the base, yellow. Scutellum black. Elytra strongly and regularly punctate-striate, the interior of the spots black, the sutural band widened at the base and connected at its end with the broader discoidal band in some specimens, but in others isolated; the latter commences at the shoulder, where it is rather narrow, and after widening slightly immediately below the base, continues straight towards the apex, where it is interrupted at some distance from the latter; the same band extends generally in width from the fifth to the ninth row of punctures, the rest of the disk of the elytra and their apices being bright yellow. Legs robust, fulvous. Underside black.

Wada toge.

From all other nearly similarly coloured species (*C. boehmi, limbellus, lateralis*) the present may be at once distinguished by the sculpture of the thorax, the close striæ of which give the latter a silky appearance, punctuation being altogether absent. In one of the specimens the yellow spots of the thorax are very small, and the two black elytral bands are almost connected anteriorly by an indistinct transverse piceous stain.

Cryptocephalus nigrofasciatus, n. sp.

♂. Below black; apex of the abdomen, legs, and base of the antennæ flavous; above testaceous; thorax distinctly punctured; elytra strongly punctate-striate, each elytron with a longitudinal black band, abbreviated behind.

♀. Larger, entirely flavous or pale fulvous.

Var. a. The elytral band very obsolete, sometimes entirely absent.

Var. b. Elytra black, the sutural and lateral margin flavous.

Length 1–1½ line.

Head with a more or less distinct central longitudinal groove, flavous, rather sparingly impressed with deep irregular punctures; antennæ slender, the joints elongate, third and fourth of equal length, the five lower ones testaceous, the rest black. Thorax slightly narrowed in front, the sides nearly straight, the posterior angles produced backwards in an acute point; posterior margin finely serrate, narrowly black; rest of the surface fulvous, rather closely and distinctly punctate, the punctures at the sides of oblong shape, and more closely approached. Scutellum slightly raised behind, testaceous, margined with black. Elytra cylindrical, each elytron with ten rows of deep punctures (the first very short), the fourth and fifth and the seventh and eighth rows united at their ends and abbreviated before the apex; the interstices at the sides slightly convex. Legs entirely fulvous. Underside black, the last abdominal segment testaceous; prosternum very broad.

Nowata, Matsuida, Fukin, road to Oyama, Wady toge.

Several nearly similarly coloured species of *Cryptocephalus* have been described, of which *C. bilineatus*, Fabr., *C. tessellatus*, Germ., and *C. convexus*, Illig., seem to be the most closely allied forms. There are, however, sufficient differences to be found in *C. nigrofasciatus* to look upon it as a distinct species, which may be separated from either of the above by the unspotted and distinctly punctured thorax, the punctures of which are distinctly elongate at the sides, and by the colour of the elytra, which have only the black band placed on the disk, the suture and lateral margin remaining of the ground-colour; this dark band is of very variable width, occupying in some specimens nearly the entire disk, while in others it is absent. These latter specimens resemble much in general appearance *C. minutus* and allied species, but may be at once distinguished by the distinctly punctured thorax. Fourteen specimens of *C. nigrofasciatus* were obtained at the above-mentioned localities.

Cryptocephalus difformis, n. sp. (Plate XI. fig. 6.)

Below piceous, above black; lateral margin of the thorax and elytra, as well as their apices, more or less flavous; thorax extremely closely punctured; elytra more strongly semipunctate-striate; legs yellow, the anterior tibiæ compressed and dilated.

Length 1¾ line.

Head finely and rather closely punctured, flattened; clypeus and the labrum flavous. Antennæ two thirds the length of the body, black, the four lower joints flavous or fulvous, third and fourth equal, the six terminal joints slightly flattened. Thorax transverse, greatly widened posteriorly, the sides with a rounded and flattened margin; surface extremely closely and rather finely punctured throughout, black, the extreme lateral, and sometimes also the anterior margin, flavous. Scutellum flat, broadly ovate. Elytra as broad as the thorax at the base, not widened behind, much more strongly, distantly, and rather regularly punctured, the punctures arranged in rather close rows, the interspaces somewhat transversely wrinkled. Legs robust and rather short, the anterior tibiæ much flattened and dilated, their inner margin broadly rounded. Abdomen more or less testaceous, rest of the underside piceous.

Nikko.

The three specimens obtained by Mr. Lewis are all males, and scarcely differ from each other. In one the anterior margin of the thorax is very narrowly flavous, and two obscure small spots of the same colour are visible on the elytra immediately below the scutellum, indicating doubtless that the general colour of the upper surface is liable to variation, so that probably individuals may exist in which the yellow colour predominates, as is the case in the closely allied *C. pini* of Europe. This latter species has the same curious dilatation of the anterior tibiæ, but is, I think, a distinct, although closely allied, species. The thorax in the present insect is longer, less transverse, more widened behind, the surface still more closely and finely punctured, and the entire coloration quite different from *C. pini*, but the same in the three specimens before me except in regard to the slight variation mentioned above; the lateral margin (narrowly) and the apex of the elytra (broadly) are flavous in all of them.

CRYPTOCEPHALUS LIOTHORAX, Solsky.

Var. SIGNATICEPS, Baly. *C. multiplex*? Suffr.

According to Dr. Kraatz these two forms must be looked upon as representing the same species. I believe, however, that the synonyms of this and several allied species are not at all clear and settled. Solsky, for example, makes no mention of the distinct white spot at the apex of the femora, visible in the type described by Mr. Baly before me, and in all the other Japanese specimens I have for comparison. Amongst these there is a variety (differing in no other way but that of colour) which agrees perfectly with one described by Suffrian as *C. multiplex* from India, which I am inclined to look upon as identical with the present species, since I cannot find any characters by which it may be distinguished. Curiously enough Suffrian, in spite of the particular and lengthened descriptions of all his species, makes no mention of the sculpture of the thorax in *C. multiplex*. Besides these named species, there are several others, very closely allied, *C. transversalis*, Suffr., *C. luridipennis*, which may prove eventually to be but varieties of *C. liothorax*, which is evidently an extremely variable species. At all events, I have little doubt about the identity of *C. multiplex* and the present insect. Another apparently very closely allied species is *C. tetrathyrus*, Solsky, which agrees again very nearly with *C. multiplex* and with some varieties obtained by Mr. Lewis, except that the anterior legs in Solsky's species are described as testaceous. In the Japanese variety the elytra are black, with the exception of the lateral margin anteriorly, and connected with a rufous transverse band; another similarly coloured round spot is placed at the apex; all this and the rest agreeing with the description of *C. multiplex*.

CRYPTOCEPHALUS SEXPUNCTATUS, Linn.

A single specimen before me I am unable to separate from the normally coloured individuals of this species, which has been reported also from Siberia.

CRYPTOCEPHALUS FULCRATUS, Germ.

The occurrence of this species in Japan extends still further its geographical distribution, it having been also recorded, like the preceding species, from Siberia. Two specimens obtained at Jensai do not differ from the European form except in their rather larger size.

CRYPTOCEPHALUS NOBILIS, Kraatz. (Plate XI. fig. 7.)

The description of this species, given by the author in the 'Deutsche ent. Zeitschr.' 1879, agrees perfectly with the ten specimens obtained by Mr. Lewis at Kiga, Suyama, and Subashiri. The insect is of a shining black colour, with two transversely shaped yellow spots at each elytron (one slightly before the middle, the other at the apex). The antennæ in the male are exactly as long as the body, but shorter in the female, and the four or five lower joints are testaceous; the punctuation of the elytra is strong, and arranged in close but not very regular rows. The specimens which served Mr. Kraatz for his description were obtained from the Amur country.

Genus PACHYBRACHYS, Suffr.

PACHYBRACHYS ERUDITA, Baly.

Pachybrachys dönitzi ?, Harold.

A great many specimens of this apparently very variable species were obtained at Tensai, Wada toge, Nikko, Kurigahara, on sallow. The specimens which served Mr. Baly for his type have the elytra almost spotless; between this and almost black-coloured individuals there is every intermediate degree before me, the most frequent form being that in which the disk of the elytra is occupied by a longitudinal broad piceous or black band, leaving only the sutural and lateral margin of the testaceous ground-colour; the thorax varies equally in colour, from a well-distinguished M-shaped mark to being almost black with two narrow yellow basal spots. I have no doubt that one of these named varieties is identical with *P. dönitzi*, Harold, as all other characters agree with the description of this author.

Genus LEPROTES, Baly.

LEPROTES PULVERULENTUS, n. sp. (Plate XI. fig. 9.)

Oblong, black, covered with white excrescences; three basal joints of the antennæ and the labrum fulvous. Head and thorax finely rugose-punctate; elytra more strongly semipunctate-striate.

Length 3–3½ lines.

Head with an obsolete median longitudinal groove, closely and finely rugose-punctate. Antennæ two thirds the length of the body, slender and filiform, the second joint distinctly shorter than the first, the third more than twice as long as the preceding, basal joint stained with piceous above, the two or three following fulvous, the rest dark piceous or black. Thorax subcylindrical, scarcely broader than long, the lateral margin entirely absent; surface sculptured like the head, obsoletely transversely depressed across the base. Elytra more strongly punctured, the punctuation arranged in very closely approached rows, the interspaces here and there obsoletely raised, surface covered with a thick layer of white powder, when rubbed shining black. Legs black, extreme apex of the tibiæ and the tarsi obscure fulvous. Femora armed with a smooth tooth.

Oyama, Kiga, Oguma, Nikko.

In size this species agrees with *L. lewisi*, Baly, and *L. fulvus*, Baly, but is quite distinct from either of them. The general colour is entirely black; and the insect, when captured, is covered with a thick layer of white powdery matter which entirely hides the punctuation from view; when rubbed, the elytra, unlike *L. lewisi*, are shining black and not covered with pubescence. In the latter species there is a finely but distinctly marked lateral margin to the thorax, which in the present insect is totally absent; the punctuation of the head and thorax also is much more finely rugose, the antennæ are proportionately longer and have the three or four lower joints fulvous.

Genus Demotina, Baly.

Demotina bipunctata, sp. nov.

Narrowly oblong, obscure fulvo-piceous, closely covered with white pubescence; antennæ and legs fulvous; head, the sides of the thorax and elytra, and a small spot at the middle of each elytron, whitish.

Length $1\frac{1}{2}$ line.

This species, although closely allied to *D. modesta*, Baly, is yet quite distinct. The antennæ are less robust, the thorax is rather more transverse, the pubescence which covers the entire upper surface is not fuscous as in the allied species, but white, covering the entire head thickly, and forming a band at the lateral and anterior margin of the thorax as well as at the sides of the elytra, while a small spot of white hairs is placed near the middle of each elytron; the punctuation of the latter as far as visible seems to be arranged in very closely approached rows. The intermediate tibiæ are obsoletely notched at their apex; claws bifid; femora with a minute tooth.

Kobe.

A single specimen was obtained by Mr. Lewis during his first journey, a second one at the last visit to Japan. The species is closely allied to *D. modesta*, Baly; but is of smaller and less robust size, and distinguished by the white pubescence in forms of stripes and spots on the elytra. *D. decorata*, Baly, is smaller still, of different coloration and with comparatively short antennæ.

Genus Nodostoma, Motsch.

Nodostoma japonicum, sp. nov.

Black; head and four basal joints of the antennæ fulvous; head and thorax closely and strongly punctured; elytra with the base swollen, distinctly punctate-striate.

Length 2 lines.

Head entirely fulvous, closely and very strongly punctured, the middle impressed with a short longitudinal groove; epistome broader than long, separated from the face by an irregular transverse groove. Terminal joints of the antennæ slightly and gradually thickened, the four lower joints fulvous, the rest black; second and third joints of nearly equal length. Thorax about twice as broad as long, the sides angulate immediately below the middle; surface closely covered with deep and round punctures, which at the middle of the disk are now and then confluent. Scutellum impunctate. Elytra with the base strongly swollen, deeply depressed below the latter and within the humeral callus, from which a short costa runs obliquely towards the lateral margin; the punctuation is strong within the basilar depression, more finely impressed and very regular at the rest of the surface; the suture is accompanied by two rows of punctures, the latter near the other portion of the apex is very fine. Femora with a small tooth, the knees sometimes as well as the base of the tibiæ dark fulvous.

Kisa.

I cannot find amongst the many eastern forms contained in this genus a species of similar coloration, which is the same in the two specimens I have for examination. All the femora are armed with a small tooth, and the thorax is angulate directly below the middle and not close to the base, as is the case in many other species of *Nodostoma*. The claws are appendiculate as usual. The two specimens before me are evidently females.

Nodostoma ruficolle, sp. nov. (Plate XI. fig. 10.)

Underside, legs, terminal joints of the antennæ, and elytra black; head and thorax rufous, strongly punctured; elytra with the base swollen, punctate-striate.

Length 2 lines.

Head strongly rugose-punctate, the epistome separated from the front only by some smooth raised longitudinal spaces. The four basal joints of the antennæ fulvous, the rest black, fourth joint slightly longer than the third. Thorax narrowly transverse, the sides obsoletely angulate near the base, its surface rather convex, rufous like the head, remotely and strongly punctured. Elytra with a distinct depression within the shoulder and below the base, the latter strongly raised and with but few punctures, the latter more crowded and deeply impressed within the depression; rest of the surface more finely and remotely punctate-striate. Intermediate and posterior femora with a minute tooth.

Nikko, Fukushima.

The dozen specimens obtained at the above locality do not seem to vary except slightly in size. The species has the same coloration as *N. davidi*, Lefèvre, from China, but differs in the strong punctuation of the thorax. In *N. balyi*, Har., the punctuation of the latter is much more closely placed, and the shape of the insect is quite different as well as its colour.

Nodostoma modestum, sp. nov.

Ovate, subquadrate, convex, entirely metallic dark blue; the second and third joints of the antennæ fulvous; thorax finely and remotely punctured; elytra depressed below the base, finely punctate-striate.

Length 2 lines.

Head irregularly but rather deeply punctured, especially anteriorly, the epistome not separated from the face. Antennæ rather more than half the length of the body, the basal joint metallic blue above, the following two fulvous, the rest black, the second joint of curved shape, nearly as long as the third. Thorax not more than twice as broad as long, the sides with a distinct tooth near the middle; surface with a rather deep transverse fovea at each side, distantly but deeply punctured, the punctures more deeply impressed at the sides than at the disk. Scutellum black, impunctate. Elytra with a deep transverse depression below the base and another longitudinal one within the shoulders, finely and regularly punctate-striate at the inner disk, more strongly and closely near the sides; within the basal depression a few transverse wrinkles are visible. Underside and legs entirely dark blue; all the femora armed with a minute tooth. Tarsi black.

Yuyama, Hitoyoschi. (12 specimens.)

It is impossible to say whether one of Motschulsky's short and insufficient descriptions is meant for the present species, which is of the same size as *N. balyi*, but differently sculptured and of a uniform violaceous blue colour. The small tooth at the sides of the thorax is placed nearer the middle than is often the case in other species of this genus.

Genus Chrysomela, Linn.

Chrysomela cyrtonoides, sp. nov.

Ovate, very convex, widened behind, brownish æneous; thorax distantly punctured; elytra rather closely punctate-striate, the interstices smooth and impunctate.

Length 2–$2\frac{1}{2}$ lines.

Head convex at the vertex, entirely impunctate; epistome separated from the face by a deep arcuate groove. Antennæ half the length of the body, rather robust, the first joint broadly dilated, the third joint not more than one half longer than the preceding, the rest gradually thickened, black, the basal joints tinged with æneous. Thorax very convex, the sides rather strongly deflexed, the lateral margin but slightly rounded, angles not pointed but distinct; surface very remotely punctured, the sides not thickened. Scutellum distinctly broader than long, impunctate. Elytra slightly wider at the base than the thorax, widened towards the middle and very convex, the apex more pointed, no humeral callus; their surface covered with closely approached rows of distinct punctures, the latter placed rather irregularly on the striæ and near the suture slightly approached in pairs and distinct to the apex; the sutural margin near the apex is accompanied by an impressed line. Prosternum broad, rugose-punctate.

Konose.

The shape of the thorax and elytra in this species resembles greatly that of the genus *Cyrtonus*, with which the present insect cannot be confounded on account of the presence of wings. *C. templetoni*, Baly, is of somewhat similar shape, but differs in every other particular. The plain and not thickened nor impressed sides of the thorax in *C. cyrtonoides* is another peculiarity of this species.

Chrysomela nikkoensis, sp. nov.

Ovate, subparallel, moderately convex, black or dark blue, shining; thorax extremely finely punctured, laterally with a longitudinal basal groove; elytra subgeminate, punctate-striate, the interstices very finely punctured.

Length 3 lines.

Head entirely impunctate, flattened. Antennæ rather less than half the length of the body, the first six joints slender and shining, the rest gradually dilated and opaque, black. Thorax about twice as broad as long, slightly narrowed in front, the anterior angles acute and somewhat produced; the disk with a few very minute punctures, only visible with a strong lens, the lateral margin bounded within anteriorly by a few stronger punctures, posteriorly by a short but deep longitudinal groove, not extending upwards to the middle. Scutellum broadly ovate. Elytra not widened behind, subquadrate, each elytron with ten distinct and regular rows of punctures, the first very short, the others arranged in pairs, the interstices also very finely punctured.

Nikko, Yunoshiku, Urasa.

It is not without some doubt that I describe this species as new, as several very closely allied forms occur in Northern Europe (*C. ordinata*, Gebl., *C. ambulans*, Fald., *C. geminata*, Payk.); but the species from Japan seems to differ from all by the shining and almost impunctate disk of the thorax, on which fine punctures are only visible with a strong lens. The interstices between the double rows of punctures at the elytra are finely but distinctly punctured, the double rows themselves consist of strong and regular lines of punctures not very closely approached in pairs.

Chrysomela geminata?, Payk.

A single specimen obtained at Hakodate I must refer to this species, although the colour of the upper surface, instead of the general dark blue peculiar to *C. geminata*, is here obscure æneous with a slight violet tint. The thorax in the specimen before me is very finely and closely punctured, except near the lateral margin, where stronger punctures are placed anteriorly, while a short but deep groove limits the posterior portion. The punctuation of the elytra consists of four stronger double rows of punctures; the interstices are everywhere closely, irregularly, and finely punctured. The antennæ are entirely black; the third joint is only one half longer than the preceding.

It is possible that the Japanese specimen represents a closely allied but distinct form.

Chrysomela obscurofasciata, sp. nov. (Plate XI. fig. 11.)

Oblong, convex, subcylindrical, dark violaceous blue or green above, below fuscous violaceous; thorax closely punctured, the sides thickened, foveolate; elytra closely and irregularly punctured, the interstices rugose, violaceous blue, the sides with a broad obscure purplish band.

Length 5–6½ lines.

Head not very strongly punctured at the vertex and at the sides, the middle of the front nearly impunctate. Antennæ slender, nearly half the length of the body, the six lower joints metallic blue, the rest black. Thorax transversely convex, the anterior margin slightly concave, posterior one broadly rounded, the sides slightly rounded in front, nearly straight at the base, the lateral margin much thickened through its entire length, deeply foveolate-punctate within, rest of the surface closely and more finely punctured. Scutellum impunctate. Elytra very convex and subcylindrical, scarcely widened behind; the entire disk covered with strongly impressed and closely placed punctures, which near the suture are generally divided by longitudinal smooth interspaces, the latter at the other parts of the surface being transversely rugose; below the shoulders is a slightly depressed space, where the punctuation is much coarser, but towards the apex it becomes very fine and close; a single row of deep punctures accompanies the extreme lateral margin; the space immediately in front of the latter is, however, generally smooth and impunctate. An obscure dark broad purplish band extends from the shoulder to the apex, narrowed at the latter place. Underside and legs more or less tinged with fulvous, otherwise violaceous blue. Prosternum deeply longitudinally sulcate.

Nügata.

More than 30 specimens of this fine and large species, obtained at one locality only, are before me. The colour of the upper side varies from green to blue and dark violaceous, the purplish band being sometimes very obscure; the punctuation of the elytra varies also rather much, being in some specimens much more closely placed than in others, and in a single specimen the punctures are much deeper and larger, the inner disk near the suture being almost devoid of punctures; in most instances, however, the punctuation is very close indeed and for the most part irregularly placed. The maxillary palpi have their apical joint broadly truncate and of very nearly the same length and width as the penultimate.

This species evidently represents the subsection of the European genus *Oreina* in Japan, and is I think closely allied to *C. speciosa*, Fabr., or one of its numerous varieties, but is, I have no doubt, distinct from that or any other species of this most difficult group. According to Mr. Baly, *C. speciosa* has the deep thoracic lateral groove broadly interrupted at its middle; in the present insect this groove is very deep and extends upwards to more than two thirds the length of the thorax, being interrupted only close to the anterior margin. In this as well as in coloration all the 30 specimens before me agree; but the punctuation, as already remarked, of the upper surface is extremely variable, but much more strongly and rugose than in any of the European species with which I am acquainted.

Genus Phytodecta.

Phytodecta robusta, sp. nov.

Broadly ovate, subquadrate, fulvous; thorax sparingly punctured at the sides only; scutellum black; elytra strongly punctate-striate, the interstices finely punctured, fulvous; two elongate spots at the base and two behind the middle, sometimes connected, black.

Length 3 lines.

Head finely and distantly punctured. Antennæ very short, not extending to the base of the thorax, entirely fulvous, the last five joints transversely dilated. Thorax transversely convex, the sides nearly straight, the basal margin broadly rounded at the middle; disk very distantly and finely punctured, the sides impressed with a few strong and more closely placed punctures. Scutellum black. Elytra convex, not broader at the base than the thorax, each elytron with ten rows of deep punctures, visible to the apex, the interstices finely but closely punctured; each elytron with an elongate subtriangular spot at the shoulder, another more rounded one at the base near the scutellum, a third, generally elongate and of triangular shape, at the sides below the middle and connected with a fourth shorter spot near the suture, this latter spot sometimes isolated; another very small sutural spot is placed at the apical angle. Underside and legs entirely fulvous, the abdominal segments strongly punctured. Tibiæ short, and broadly dilated at the outer side.

Miyanoshita, Hiogo (also coll. *Jacoby*).

This species is of a much more convex and robust shape than most of our European forms, from which and others it may be further distinguished by the nearly impunctate or sparingly punctured thorax, the entirely fulvous and short antennæ, and the different shape of the elytral spots, the outer ones of which are very elongate, the inner ones of more rounded shape. The tibiæ are also very short and more dilated than usual, and the broad base of the elytra gives the insect a general square-shaped appearance. A single specimen is contained in my own, two others in the collection of Mr. Lewis.

PHYTODECTA RUFIPES, De Geer.

Taking into consideration the great variability of our European species of *Gonioctena*, the synonymy of which in regard to several described species is not at all cleared up at present, I have referred the specimens obtained at Nikko to the present species, although there are perhaps sufficient differences present to justify its separation. All the specimens before me are much smaller than those obtained at Hakodate and noticed and named by Mr. Baly in the Transactions of 1873; the elytral spots are obscure (although placed as in *P. rufipes*), in one instance confluent and occupying nearly the entire disk; but the short antennæ, punctuation of the elytra, and the entirely rufous legs agree with *P. rufipes*. As, however, all the six specimens are of half the size only of the last-named species, it is not improbable that they really represent another species.

PHYTODECTA GRACILICORNIS ?, Kraatz.

The description of one of the varieties with confluent spots, given by the author (Deutsche entom. Zeitschr. 1879), agrees so well with the three specimens contained in this collection that I must refer them to the present species. The antennæ are slender and the joints are of the same comparative length; but the entire head, thorax, underside, and legs are black, the disk of the thorax is very finely punctured, in some specimens almost impunctate, the sides are very strongly punctured (Dr. Kraatz says nothing about the sculpture of the thorax). The elytra have the interstices either very finely punctured or impunctate, and the posterior spots are in two specimens confluent, forming two irregular concave-shaped bands, the posterior of which includes a small fulvous spot near the apex (as given in the author's description). The characteristic feature of this species, in regard to the markings of the elytra, seems to be the large sutural spot common to both elytra which is placed below the middle and is either separated or connected with the lateral spots. I have no doubt that the Japan specimens are but slight varieties of Kraatz's species, although an examination of the type alone can settle the point.

PHYTODECTA NIGROPLAGIATA, Baly.

This species seems to me extremely closely allied to *P. viminalis* or *P. rubripes*, with which it agrees entirely in the pattern of the elytra; the latter are, however, closely and distinctly punctured at the interstices, much more so than in the allied species, which will help to distinguish *P. nigroplagiata*. The specimens contained in Mr. Lewis's collection have all black undersides and legs as well as the five last joints of the antennæ, of which Mr. Baly makes no mention. There is also a black transverse band placed at the base of the thorax, also unnoticed in Mr. Baly's description.

Genus GASTROLINA, Baly.

GASTROLINA JAPANA, n. sp. (Plate XI. fig. 12.)

Oblong, subdepressed, greenish black; thorax and legs fulvous, knees metallic green; thorax closely punctured at the sides; elytra metallic green, closely punctured, the lateral margin with a longitudinal costa.

Var. Elytra obscure cupreous.

Length 3 lines.

Head greenish black, finely and closely punctured, depressed between the eyes; antennæ extending to the base of the thorax, the four lower joints fulvous, the rest black, third joint elongate and the longest. Thorax transverse, the sides nearly straight, the anterior angles broadly produced; surface with several irregular depressions; the disk impunctate, the sides closely punctured. Scutellum black, triangular. Elytra strongly depressed along the suture, very closely and distinctly covered with larger and smaller punctures, now and then arranged in irregular lines; parallel and close to the lateral margin runs a narrow ridge or costa nearly to the apex. Underside greenish black, the sides of the breast more or less marked with fulvous; legs of the same colour, the knees and tarsi greenish or quite black.

At once distinguished from the other two known species by the unicolorous fulvous thorax, legs, and base of the antennæ.

EXPLANATION OF PLATE XI.

Fig. 1. *Hæmonia japana*, p. 190.
2. *Donacia constricticollis*, p. 192.
3. *Crioceris lewisi*, p. 194.
4. *Pedrillia unifasciata*, p. 197.
5. *Chlamys japonica*, p. 198.
6. *Cryptocephalus difformis*, p. 201.
7. —— *nobilis*, p. 203.
8. —— *partitus*, p. 200.
9. *Leprotes pulverulentus*, p. 203.
10. *Nodostoma ruficolle*, p. 205.
11. *Chrysomela obscurofasciata*, p. 208.
12. *Gastrolina japana*, p. 210.

March 3, 1885.

Prof. W. H. Flower, LL.D., F.R.S., President, in the Chair.

Dr. E. Hamilton laid on the table the specimen of the supposed Wild Cat (*Felis catus*) from Donegal, Ireland, exhibited by Mr. Tegetmeier at the last meeting, and made the following observations:—

It is recorded that at the meeting of the Society on Tuesday, January 28, Mr. Tegetmeier exhibited a specimen of the Wild Cat (*Felis catus*) from County Donegal, Ireland.

As up to the present time there is no authentic instance of the

Wild Cat being indigenous to Ireland, I wrote to Mr. Tegetmeier for further information, and he has kindly allowed me to examine the skin. As far as can be judged by external marks, I have no hesitation in saying that this skin from Donegal is only another of the many specimens which from time to time have been recorded as Wild Cats, but which are only the offspring of domestic Cats that have run wild and have bred in the woods and mountains of the district. It is a well-ascertained fact that the progeny of these Cats, after two generations, always assume the grey, brindled, or tabby fur; but the difference in the tail and feet in the wild species (*Felis catus*) is very distinct.

Many of our early English naturalists who have written upon the subject have stated that the Wild Cat is to be found in Ireland. But neither Pennant nor Bewick gives Ireland as its habitat. Sir W. Jardine says:—"In Ireland it abounds in similar situations as in England and Scotland, that is in the mountainous districts," but his only authority was information derived from his brother, an officer stationed with his regiment in the west of Ireland. Bell, in the edition of 'British Quadrupeds,' 1837, says "some parts of Ireland." This remark is repeated in the edition of 1864, without further comment, although at that date it had been well ascertained that the animal did not exist in Ireland. Mr. Thompson, in his 'Natural History of Ireland,' says:—"The Wild Cat (*Felis catus*) cannot with certainty be given as a native animal." Mr. Thompson appears to have thoroughly investigated the matter; and his opinion is of great importance. He says the largest Cat he ever saw, which weighed 10 lb. 9 oz., was shot in a wild state at Shanes Castle; this specimen was *Felis catus* in everything but the form of the tail, which was not bushy at the end, and the fur, which was finer in texture. In the Larne Journal, Feb. 1839, it was reported that the Wild Cat was found in Tullamore Park, and also used to frequent the shores of Ballintrae; "but on questioning Mr. Creighton, Lord Roden's game-keeper, he informed me that he had never seen this species in Ireland." He was able to compare this Cat with two Wild Cats which had been brought to him in the flesh by his relative Mr. Langtrey, which had been killed a few days previous in Aberdeenshire; and he says it was as strong in every respect as that animal but of a lighter grey colour, and he says the animal appeared to be a genuine hybrid between *Felis catus* and the domestic Cat.

Further investigations since Thompson's time all tend to prove the non-existence of this species in the sister island. Sir Victor Brooke writes:—"A well-authenticated instance of the occurrence of the true Wild Cat in Ireland has never been recorded. Several specimens of Cats closely resembling in markings the Wild Cat have from time to time been produced as veritable examples, but upon inspection by naturalists they have invariably proved to be descendants of tame Cats run wild, perhaps for several generations. These beasts attain a great size, and very closely assimilate to the true Wild Cat in their form and coloration."

Mr. La Touche says:—"I have just received your letter. Last Sunday I met one of my Galway cousins, and he told me that he remembered when he was a boy the County Grand Jury gave money for heads of Wild Cats, which were supposed to be most numerous and destructive, and that he well remembered his father's keeper (his father was Sir John Burke, of Marble Hill, county Galway) often getting this money. I asked him if he ever saw the Cats, and he says he recollects being shown one or two, and they were *Martens*, always called Cats by Irish keepers."

Mr. Kennedy writes:—

"I do not believe in the existence of the true *Felis catus* or Wild Cat as indigenous in Ireland, although Knox, Maxwell, and others state that they have seen them; all I know is that Carte, our highest authority here (curator of the Dublin Society's Museum), has been trying for years to get a specimen of it without success. The examples alluded to are, I imagine, wild tame Cats such as you and I have seen prowling after birds and small vermin in the woods, which do much mischief in this way; but they are smaller than the Wild Cat and have not the short bushy tail. Your friend will find in Thompson's 'Natural History of Ireland' all that can be said in favour of the Wild Cat existing in Ireland, but that is not conclusive."

Sir J. W. Wilde writes:—

"I have known a great number of Cats in my time—gentle, tame, spiteful, venomous, vicious, cruel, clean, dirty, honest, stealing, &c.; but I never saw a Wild Cat, certainly not in the west of Ireland; all Cats I saw there were evidently tame ones that had got into the rocks and become wild."

In another letter he says:—

"Mr. La Touche has asked me to communicate with you respecting the existence of the Wild Cat in Ireland. I never met with such an animal, although, both as a sportsman and somewhat of a naturalist, I have had ample opportunities for observation. There is no purely Irish name for Cat, for the word Catt, or, as it is pronounced, Catta, is a mere corruption of the English term. In the 'Proceedings' of the Royal Irish Academy for 1860 you will find a lengthened essay of mine upon the unmanufactured animal remains then belonging to that institution: it contains much curious information on the ancient animals of Ireland. That the Domestic Cat has occasionally strayed from home and gone wild is quite true; and instances of the kind occurred in my place in Connemara some years ago, where in a cave by the lake-side a Cat brought out her young, and, frightened by the dogs, would never come near the house again.

"The only ancient reference which I can now lay hands on is that of the ancient Irish poem treated of in the tract already referred to, where it is said two Cats were procured from the cave of Ratticrohan in county Roscommon, but I see no reason for believing that they were originally wild. The word used in the original MSS. is *Chait*, but it is evidently a corruption of the English term."

It is very evident therefore that the Wild Cat does not exist in Ireland; had it been otherwise, undoubted examples would long since have been discovered, and any doubts finally set at rest. Such not being the case, we must exclude Ireland from the list of countries inhabited by *Felis catus.*

Felis catus, so far as is known, inhabits the northern part of Great Britain, where it has become extremely rare, France, Germany, Poland, Switzerland, Hungary, the southern part of Russia, Spain, Dalmatia, Greece, and part of Turkey. It is not found in Ireland, Norway, Sweden, Italy, or North Russia.

A letter was read from Mr. J. H. Thompson, of New Bedford, Mass., U.S.A., C.M.Z.S., stating that "among some interesting land Mollusca collected by Mr. P. G. Thompson on the island of Eleuthera, or rather on a small 'key' adjacent to the north end of Eleuthera (Bahama Group, West Indies), were several specimens of *Helix* (*Hemitrochus*) *filicosta,* Pfr. (P. Z. S. 1845, p. 73; Reeve, Icon. no. 1437), the locality of which had been previously unknown.

The following papers were read:—

1. General Observations on the Fauna of Kilima-njaro. By H. H. Johnston, F.Z.S.

[Received March 3, 1885.]

I have been asked to say a few words of a general character to precede the papers which will be read before you to-night on the subject of the collections made by the Kilima-njaro Expedition. This undertaking, I need not remind you, was made at the joint expense of the British Association and the Royal Society. The Kilima-njaro Committee which was formed by these two Societies honoured me by choosing me as the leader of the Expedition, and placed £1000 at my disposal. This sum, while amply sufficient for equipping and supporting an ordinary African expedition during six months, did not allow of my taking any European collectors with me, as every individual who had any knowledge of natural-history collecting required his travelling expenses to be paid between London and Zanzibar, going and returning, and about £100 salary, with provision made for his widow and children in case of untimely demise.

I did not leave England, however, with an idea that the task of making the natural-history collections would solely devolve on myself. Collectors from India had been spoken of and their expenses were to be defrayed by the authorities of the Indian Botanical Gardens. On arriving at Zanzibar I found the disagreeable news awaiting me that none of these promised helpers could be sent owing to their great dislike to travelling in Africa. Consequently I had to depend on the chance aid of such natives of Zanzibar accompanying my caravan as might evince any taste for natural-history.

Sir John Kirk, indeed, procured for me two men who had been with Dr. Fischer during his recent expedition, and who had an elementary knowledge of drying plants and skinning birds; but these men, on account of their superior attainments, were so exacting and difficult to deal with, that when they deserted me soon after my arrival on the mountains, to go slave-trading, I did not miss them keenly. Nevertheless, after this the entire care of collecting fell upon me, added to the already existing and by no means perfunctory cares of superintending the expedition. I had not only to conduct long and wearisome palavers with native chiefs in a language which I had to laboriously acquire, I not only had to show the men how to build houses, where to construct roads and bridges, but I must also shoot and skin birds, gather and press plants, collect beetles, and catch butterflies. In a moist climate like that of Kilima-njaro the labour involved in making good botanical collections alone was very great, and in all this I had no help. My Zanzibar porters, although excellent, hardworking, faithful fellows, evinced no aptitude whatever for natural-history collecting. In spite of my repeated and painstaking instructions, they *would* bring me flowers without leaves and leaves without flowers. They preferred catching butterflies with their fingers to using a net, and thought that an insect in fragments was quite as satisfactory as a whole specimen. In short I found that if any work was to be of use in collecting, it must proceed solely from my own efforts. I merely mention this in order to explain to you the reason why I have not larger collections to lay before you to-night.

I will now briefly note the general features of the Zoology of the region I have just visited, confining myself to remarks on such forms as came prominently under my notice. In doing this it will be perhaps more convenient to take the classes, families, and genera in their generally accepted order.

To begin with our near kinsfolk, the Monkeys, I found these creatures much more abundantly present in East-Central Africa than during my journeys on the west coast. Although Western Africa is probably better provided with species of Quadrumana than any other division of the continent, the Monkeys are much scarcer in numbers and harder to see, possibly owing to the density of the forests.

During eight months passed on the Congo I only saw Monkeys twice in a wild state, and that in one place only; and throughout my entire stay of 16 months in West Africa I can only remember six occasions on which I actually beheld these animals in a state of nature. On the other hand, I had scarcely left the East coast to journey towards Kilima-njaro, than Monkeys showed themselves abundantly in the wilds.

The first to attract my attention were the Baboons, probably the species known as the Yellow Baboon. They were generally found on the outskirts of native plantations, where they almost subsisted on the maize and other food-stuffs stolen from the gardens of their more highly developed fellow Primates. In the inhabited region of Kilima-njaro, generally known as the country of Chaga, Baboons were strangely abundant. They went generally in flocks of from fourteen to twenty, of all ages and both sexes. They were so little molested by the natives that they showed small fear of man, and instead of running away would often stop to look at me about 20 yards off, and the old males would show their teeth and grunt. I have frequently seen the natives driving them from the plantations as they might a troop of naughty boys, and the Baboons retreating with swollen cheek-pouches, often dragging after them a portion of the spoil. On one occasion, in the river-bed at the foot of Kilima-njaro, my Indian servant Virapan, ordinarily a very plucky boy, met a troop of Baboons, who, instead of fleeing up into the trees, came running towards him in a very menacing manner, and he was so frightened at their aspect that he took to his heels. The Baboons followed, and but that the boy forded the shallow stream and put the water between him and his pursuers he might have had an awkward contest. I killed a Baboon once in Chaga, one of a troop who were rifling a maize plantation, and its companions, instead of running away, surrounded the corpse and snarled at me. As I had no more ammunition I went back to my settlement to fetch some of my followers, and upon the approach of several men the Baboons ran off. We picked up the dead one, and carried it back. It was a female, and apparently young and tender. Out of curiosity I had its flesh cooked the next day and ate it, hoping in this way to form some idea of the practice of cannibalism ; I can only say that the succulence and quality of this creature's flesh were quite unexceptionable. I have noticed this with every species I have as yet tasted of Old-World monkey. During my three months' stay in Mandara's country I ate the common *Cercopithecus pyerythrus* constantly, and found it made a very toothsome stew. The most remarkable monkey in all this region is probably the Colobus, which apparently offers a new variety or subspecies in the country round Kilima-njaro, remarkable for having an entirely white, heavily plumed tail. The common species, with a black tail tipped with white, I have shot in the forested plains nearer the coast. The Colobus Monkey is almost the only one that quite avoids the neighbourhood of man ; the other genera frequent the neighbourhood of native plantations, and doubtless profit by the abundance of cultivated food. I never observed any Galago in this district nor do natives speak of one, although it is a genus well represented in other parts of East Africa.

Bats are by no means common or often seen. I saw some Fruit-Bats once in the forest hanging to a sycamore-fig tree. No member of the groups of Insectivora came under my notice.

The Carnivora in this country of big game are of course well represented. The Lion is very abundant and very bold ; but the Leopard is more feared by the natives than his larger ally. While stopping in Mandara's country two of that chief's subjects were killed by Leopards, one of them close to the frequented village-green. The Leopard ascends the mountain up to about 8000 feet, scarcely higher. I shot one of these creatures in the valley of a stream in broad daylight. I think it had been sleeping by the water and was suddenly aroused by my near approach and too dazed to run off immediately. I shot at a Lion once and missed him, and the king of beasts, after looking at me over his shoulder, magnanimously trotted off.

The most common Dog is the Side-striped Jackal. There is a wild Dog found on Kilima-njaro which barks loudly. It is quite nocturnal, and I have never been able to shoot it; but judging from its appearance in bright moonlight it is somewhat like the Abyssinian Dog. The natives know it by a different name than that applied to the Jackal.

Hyænas are very common, and both species, Striped and Spotted, are present; but the Striped Hyæna more affects the hills, while the Spotted kind inhabits the plains. The Spotted Hyæna is a much more predatory animal here than one generally imagines. Not only does it steal sheep and calves from the herds, but it even carries off children, and will often attack wounded and weakly men. I once sent a sick man back to the coast a short distance by himself, and he was severely bitten at night by the Hyænas. He succeeded, however, in beating them off, and recovered from his wounds.

Civets and Genets are very common; so also are one or two species of Ichneumon. I noticed no kind of Weasel, Ratel, or Badger.

The *Orycteropus,* or Ant-bear, is common on the plains, to judge by his many huge burrows; but I have never seen him, and only identify him from natives' description.

Among the Rodentia there were few that came under my notice. The Porcupine is fairly common; and there are divers small Mice. One of them I caught in a trap, and made some drawings of, which are here to-night. Unfortunately its skin, in common with that of a small black Rat infesting natives' houses, was lost.

I have brought home skins of a species of Tree-Hyrax which is found on Kilima-njaro between the altitudes of 7000 and 11,000 feet. I also prepared its skull and skeleton; but these, along with some other skins of mammals, were accidentally left behind at Taveita when I started for the coast. I did, however, send word to those of my followers left behind to bring them back and hand them over to Sir John Kirk to forward to England. The Hyrax is much sought after by the Wa-chaga for its warm, furry skin, which is made into cloaks.

The Elephant inhabits Kilima-njaro up to a great height. I have seen two females and a young one at an altitude of 13,000 feet. The ivory of this part of Africa is considered superior to any other by the merchants of Zanzibar. Round the base of the mountains the Rhinoceros is very abundant; and in Lake Jipe Hippopotami are found. The Zebra (*Equus chapmanni*) is found in incredible quantities in the plains round Kilima-njaro. In fact, the vast herds of varied game which pasture on the level country between the Snow Mountains and the coast remind one of the tales of Gordon Cumming.

Among the most noticeable Ruminants are the Buffalo (*Bubalus caffer*, to judge by its horns), the Giraffe (very abundant), the Eland, the Kudu, the Bush-buck (*Tragelaphus sylvaticus*), the Sable Antelope (*Hippotragus niger*), the Pallah, one or two Gazelles, Gnus, Hartebeests, Blessboks, and many small species of *Neotragus* and *Cephalophus*.

The Kudu penetrates up the mountain to a height of 14,000 feet, in company with the Buffalo, attracted possibly by the sweet perennial pasture. A *Neotragus* and *Cephalophus* are also found at high altitudes. I have nowhere seen the Lesser Kudu, although a letter, which I have received this morning from a friend who has been shooting on the river Tana, a little to the north of Kilima-njaro, shows it to be abundant there. Wart-hogs are common, and penetrate to a height of 8000 feet up the mountain.

I will not trouble you with much respecting the birds of Kilima-njaro, as I have contributed some notes to Capt. Shelley's able paper, written on the skins in my collection. I would, however, remark on the great abundance of the Ostrich in the district round Kilima-njaro. Curiously enough, it would seem, I know not why, that this Ostrich never produces fine plumes. The Arab traders find them worthless, at any rate, in the Zanzibar and Aden markets, while the feathers from Somali-land fetch good prices. During my residence at Taveita I kept many young Ostriches alive, and brought several to the coast; but they all died during the journey.

In the large rivers at the base of Kilima-njaro and in Lake Jipe Crocodiles are found. Large Lizards inhabit the forests. Smaller Lizards and Chameleons are very abundant. I have met with Chameleons up to a height of 13,000 feet; and have also found a Frog at the same altitude. I forgot to mention that at this height, in an ice-cold stream, I captured the young of a Duck—of what species I do not know, as they were in the down.

Fish are nowhere found in the rivers of Kilima-njaro, save in the river Lumi, which flows into Jipe. I have here to-night a drawing of the only kind seen. In Jipe I have caught a *Silurus*, apparently the same as the "Bagre" of the west coast. Freshwater Crabs are common in the mountain-streams.

Throughout this region Butterflies were few and scarce, except at Taveita. Few kinds penetrated higher than 8000 or 9000 feet. Bees and Wasps were found up to 14,000 feet.

In summarizing this very hasty review of the fauna of Kilima-njaro, I might remark that the animals were much more abundant in the plains than on the higher ground; and that the further we ascended towards the snowy summits, the scarcer were the signs of animated life.

Hanhart imp.

COLOBUS GUEREZA CAUDATUS.

2. Report on the Mammals obtained and observed by Mr. H. H. Johnston on Mount Kilima-njaro. By Oldfield Thomas, F.Z.S., Natural-History Museum.

[Received March 2, 1885.]

(Plate XII.)

The Mammalia collected by Mr. Johnston during his late expedition to Kilima-njaro nearly all belong to common and widely distributed species; but his observations on the vertical distribution, comparative rarity, native names, &c., of the different mammals of the district are well worthy of being recorded.

The following were the species observed by Mr. Johnston, the numbers of those of which specimens were not brought home being placed within brackets.

1. Cercopithecus pygerythrus, Geoffr.

a, b. Moshi, on the south side of the mountain, 5000 feet, June to August.

Very common in the cultivated gardens round the village, and in the forests lower down at Taveita. These Monkeys are exceedingly familiar and mischievous, coming into the gardens to steal fruit, &c., and are entirely without any fear of man.

2. Colobus guereza caudatus, subsp. nov. (Plate XII.)

a. Useri, N.E. flank of mountain, 3000 feet, end of October.

Very common all round the base of Kilima-njaro.

The specimen brought, like two or three beautiful skins obtained by Mr. Thomson in the same neighbourhood, belongs to a peculiar race or variety apparently restricted to this region, and characterized by having the white brush of the tail very much larger and finer than is the case in the true Abyssinian *C. guereza.* In the latter animal the proximal 12 to 16 inches of the tail is short-haired and quite black, only the terminal 8 to 12 inches being white and tufted, and the white mantle hanging down from the body hides only about one third of the black part of the tail. In the Kilima-njaro race, however, only some 3 or 4 inches of the base of the tail are black, and the remainder (with the hairs about 20 or 21 inches) is developed into a magnificent white brush, of which individual hairs are from 7 to 9 inches in length. The hairs of the white body-mantle, moreover, entirely cover the black at the base of the tail, the white of the latter and of the mantle being quite continuous.

In addition to this race, however, the true Guereza is also found in the neighbourhood of Kilima-njaro, as the mantle of the lowland Masai warrior, of whom a drawing is given in Mr. Johnston's forthcoming work, is made of the skin of this animal, but this is, of course, a rather vague indication of the original locality of the specimen. Mr. Johnston tells me that the natives clearly distinguish the two races, and that the white-tailed form is, at least in the Kilima-njaro district, a more strictly mountain animal than the other.

Taking now into consideration the extreme constancy of the markings of the *Colobi*, the very different appearance that the present animal has from the usual type, its restriction to a small district round Kilima-njaro, and the distinction by the natives of the two forms, I think it will be necessary to distinguish Mr. Johnston's animal as a separate variety or subspecies, to which the name of *C. guereza caudatus* might be applied.

[3.] Felis leo, L.

The Lion is abundant in the neighbourhood, but never ascends higher than about 3000 feet.

4. Felis pardus, L.

a. Near foot of mountain, 3000 feet.

The Leopard is very common up to about 7500 feet.

5. Genetta tigrina, Schr.

a. Moshi, 5000 feet, October.

b. Taveita, 2300 feet, August.

Very common; occurs up to 7000 feet. A female specimen, caught by Mr. Johnston, gave birth to three young at about the end of October.

6. Herpestes caffer, Gm. (?).

a. Moshi, 5000 feet, August.

Is not properly a mountain animal, but occurs round the village for the sake of the fowls and other prey which it can manage to steal there.

Without the skull it is impossible to determine with certainty whether this is *H. ichneumon*, L., or *H. caffer*, Gm.; but the skin has, on the whole, rather more the appearance of *H. caffer*, and it is therefore provisionally referred to the southern form.

7. Canis lateralis, Scl.

a. Moshi, 5000 feet, August.

Very common round the village, to which it is attracted by the chance of stealing refuse, &c.; not otherwise found much above 3000 feet.

[8.] Canis, sp.

Mr. Johnston several times saw and heard a species of Dog or Fox, which he was not able to obtain, but which looked rather like a large Fox, and emitted a distinct bark, similar to that of a domestic Dog. It is just possible that this was the rare Abyssinian *Canis simensis*, Rüpp., no other animal appearing at all to agree with Mr. Johnston's description.

9. VESPERUGO NANUS, Peters.

a. Moshi, 5000 feet, September 12.

Found hanging to a tree in the daytime.

10. HYRAX BRUCEI, Gray (?).

a, b. ♂ and ♀, 10,000 feet, on the south side of the mountain, 26th October.

Native name in Bantu—Ki-biru (plural Shi-biru).

Fairly common in the mountain-forests, where they live entirely in the trees, and not among the rocks. They do not descend below about 7000 feet and range up to 11,000 feet. These two specimens were brought alive to Mr. Johnston; but the female, after giving birth to three young, died almost at once, and the male, refusing to eat, also died in three or four days.

The specimens agree exactly, so far as can be made out from skins only, with the type of Gray's *H. irrorata* (Ann. Mag. N. H. 1869, p. 242), a species, however, which Mr. Blanford (Geol. Zool. Abyss. p. 252, 1870) has shown to be probably not specifically separable from the same author's *H. brucei*. Mr. Blanford obtained his Abyssinian Conies at elevations varying from 2000 to 8000 feet, and it was only to be expected that specimens inhabiting a locality so much further south as Kilima-njaro should have been found ranging as high as 11,000 feet above the sea.

[11.] ELEPHAS AFRICANUS, L.

Mr. Johnston states that he himself saw and shot at Elephants at an altitude of no less than 13,000 feet.

12. RHINOCEROS BICORNIS, L.

a, b, c. Horns; Taveita, 2300 feet, end of October.

Very common on the elevated plains at the base of Kilima-njaro, but not ascending the mountain itself. Is not found in the true forest, but only in the bush.

These horns were brought in to Mr. Johnston by the A-kamba people, who obtain them by killing the animals with poisoned arrows.

13. EQUUS BURCHELLI, Gray.

a. Taveita, 2300 feet, 25th August.

Very common, in herds of about 20, on the open plains round the mountain, never ascending above about 2400 feet.

This specimen, like all those I have seen or heard of from localities on or north of the Zambesi, belongs to the so-called *Equus chapmani*, Layard [1], in which the dark stripes extend on the limbs right down to the hoof.

That this form, however, cannot be distinguished specifically from the true *E. burchelli* is sufficiently proved by the following sentence, extracted from Mr. T. E. Buckley's useful paper on the distribution

[1] P. Z. S. 1865, p. 417.

of South-African mammals[1]:—"Out of five of these animals shot in one herd, there were individuals showing every variation of colour and marking, from the yellow and chocolate stripes to the pure black and white, the stripes in some ceasing above the hock, and in others being continued distinctly down to the hoof." On the whole, the somewhat ugly trinomial "*Equus burchelli chapmani*" seems to express fairly correctly the degree of distinctness to which this northern race has attained.

I am told by Mr. Thomson also that throughout his travels in Eastern Equatorial Africa he has never seen any but this leg-striped race of Burchell's Zebra.

[14.] PHACOCHŒRUS, sp.

Wart-hogs are found on Kilima-njaro up to an elevation of 8000 feet.

[15.] BUBALUS CAFFER, Sparrm. (?).

According to Mr. Johnston, Buffaloes occur commonly in the forests up to 14,000 feet. Whether these are *B. caffer* or *B. æquinoctialis*, Blyth (*B. centralis*, Gray), is doubtful, but a magnificent pair of horns brought by Mr. Thomson from the same region belong undoubtedly to *B. caffer*; and I therefore provisionally refer those seen by Mr. Johnston to the same species.

[16.] STREPSICEROS KUDU, Gray.

Mr. Johnston states that the Kudu ranges up to no less than 14,000 feet, at which height it is by no means rare.

[17.] NEOTRAGUS, sp.

A dwarf Antelope, perhaps *N. kirki*, Günth., occurs on Kilima-njaro up to an elevation of 14,000 feet. A sketch of it was brought home by Mr. Johnston, and will be published in his forthcoming work.

3. On the Collection of Birds made by Mr. H. H. Johnston in the Kilima-njaro District. By Captain G. E. SHELLEY, F.Z.S.; with Field-notes by Mr. H. H. JOHNSTON, F.R.G.S.

[Received March 2, 1885.]

(Plates XIII. & XIV.)

The collection contains examples of fifty species, including the following six considered to be new to science:—*Muscicapa johnstoni*, *Pinarochroa hypospodia*, *Pratincola axillaris*, *Nectarinia johnstoni*, *N. kilimensis*, and *Cinniris mediocris*. The notes are by the collector, Mr. Johnston.

[1] P. Z. S. 1876, p. 282.

P. Z. S. 1885 Pl. XIII

J. G. Keulemans lith. Hanhart imp.

PINAROCHROA HYPOSPODIA

J. G. Keulemans lith.

Hanhart imp.

NECTARINIA JOHNSTONI.

1. Neophron monachus (Temm.).

Neophron monachus, Sharpe, Cat. B. Brit. Mus. i. p. 19.

Neophron pileatus, Fischer, Zeitschr. ges. Orn. (Madaraz), 1884, p. 376.

♂, 5000 feet.

Not observed higher up the mountain, as it frequents the more thickly inhabited parts; often in flocks associated with the Ground Hornbills and the White-necked Ravens.

2. Polyboroides typicus, Smith.

Polyboroides typicus, Sharpe, Cat. B. Brit. Mus. i. p. 48.

♀, 5000 ft.

Only met with in the neighbourhood of villages. Their feathers and those of the Kite are much prized by the natives for the ornamentation of their capes.

3. Buteo augur, Rüpp.

Buteo augur, Sharpe, Cat. B. Brit. Mus. i. p. 175; Fischer, Zeitschr. ges. Orn. (Madaraz), 1884, p. 374.

♂, 4000 ft.; ♂, 5000 ft.; ♂, 8000 ft.

4. Buteo desertorum (Daud.).

Buteo desertorum, Sharpe, Cat. B. Brit. Mus. i. p. 179; Fischer, Zeitschr. ges. Orn. (Madaraz), 1884, p. 374.

♂, 5000 ft.

5. Asturinula monogrammica (Temm.).

Asturinula monogrammica, Sharpe, Cat. B. Brit. Mus. i. p. 275; Fischer, Zeitschr. ges. Orn. (Madaraz), 1884, p. 374.

♂, 5000 ft.

6. Barbatula leucotis, Sundev.

Barbatula leucotis, Marshalls, Monogr. Capitonidæ, p. 131, pl. 52.

Megalæma leucotis, Fischer, Zeitschr. ges. Orn. (Madaraz), 1884, p. 371.

♂, 3000 ft.; ♀, 6000 ft.

It inhabits the dense forest, where its presence is often proclaimed by its harsh strident note, which it repeats at intervals, and being a bold bird is easily killed. The first pair were met with at Taveita, perched on the bough of a mimosa, and others were seen on the southern flank of the mountain up to 6000 feet.

7. Halcyon orientalis, Peters.

Halcyon orientalis, Sharpe, Monogr. Alcedinidæ, p. 181, pl. 66; Fischer, Zeitschr. ges. Orn. (Madaraz), 1884, p. 361.

♂, 5000 ft.

Feeds principally upon the small crabs which inhabit the mountain-streams.

8. Buceros cristatus, Rüpp.

Bycanistes cristatus, Elliot, Monogr. Bucerotidæ, pl. 26.

Buceros cristatus, Fischer, Zeitschr. ges. Orn. (Madaraz), 1884, p. 361.

♂, 4000 ft.; ♀, 5000 ft.; ♀, 6000 ft.

Generally distributed over the mountain up to 6000 ft., especially near habitations. They show no fear of man, being generally protected by the natives, who look upon them with superstitious awe, arising possibly from their being useful scavengers, as well as from their peculiar loud cry, which resembles at times that of the wailing of a woman in distress, at others that of the braying of an ass. In August and September they were breeding, and occasionally the head of the female might be seen peering out from a hole in a tree some 30 or 40 feet high, where she had been plastered in by her affectionate husband. By the chips lying about, it would appear that these holes are excavated by the birds to the required size. These birds are monogamous, and show great affection for each other, which is fortunate, as the female during incubation has entirely to rely on her mate for daily subsistence.

9. Buceros melanoleucus, Licht.

Tockus melanoleucus, Elliot, Monogr. Bucerotidæ, pl. 49.

♂ ♀, 5000 ft.

10. Eurystomus afer (Lath.).

Eurystomus afer, Sharpe, Ibis, 1871, p. 274.

Two ♂, 3000 ft.

Often mobs birds of prey.

11. Turacus hartlaubi (Fischer & Reichen.).

Corythaix hartlaubi, Fischer, Zeitschr. ges. Orn. (Madaraz), 1884, p. 363.

♂ ♀, 10,000 ft. Bill red and green. Skin round the eyes scarlet. Sexes similar.

It frequents the forest, and is most abundant at about 9000 feet. Its loud cry may be frequently heard, but it is difficult to see amongst the thick foliage, and still more difficult to approach, being very shy.

12. Colius leucotis, Rüpp.

Colius leucotis, Fischer, Zeitschr. ges. Orn. (Madaraz), 1884, p. 363.

♂, 5000 ft.; 2 ♂, 6000 ft.

13. Hapaloderma narina (Vieill.).

Hapaloderma narina, Fischer, Zeitschr. ges. Orn. (Madaraz), 1884, p. 368.

♂, 3000 ft.

This specimen agrees better with the Natal birds, with which we have compared it, than with the equatorial race, *H. constantia*, Sharpe.

Only one specimen seen at Taveita, in the forest: it must be scarce, as the natives appear to have no name for it.

14. Alseonax minima (Heugl.).

Muscicapa minima, Heugl. Orn. N.O.-Afr. p. 435, pl. 18. f. 1.

♂, 4000 ft.; ♂, 6000 ft.; ♂, 7000 ft.

15. Muscicapa johnstoni.

Muscicapa johnstoni, Shelley, P. Z. S. 1884, p. 558.

♀, 6000 ft.

Found on the southern slope of the mountain just above Moshi, on the borders of the cultivated district.

16. Lanius caudatus, Cab.

Lanius caudatus, Gadow, Cat. B. Brit. Mus. viii. p. 254; Fischer, Zeitschr. ges. Orn. (Madaraz), 1884, p. 344.

♂, 3000 ft. In immature plumage.

This species affects the desert and waterless districts at the foot of the mountain, where it perches upon the low shrubs, and pounces upon the grasshoppers, which are very abundant in these districts, and form its principal food.

17. Lanius collaris, Linn.

Lanius collaris, Gadow, Cat. B. Brit. Mus. viii. 1883, p. 255.

Lanius humeralis, Fischer, Zeitsch. ges. Orn. (Madaraz), 1884, p. 344.

♂, 4000 ft.; ♂ ♀, 5000 ft.; ♂, 6000 ft.; 2 ♀, 7000 ft.

One of the commonest birds on the mountain, and very bold.

18. Dryoscopus sublacteus, Cass.

Dryoscopus sublacteus, Gadow, Cat. B. Brit. Mus. viii. 1883, p. 140; Fischer, Zeitschr. ges. Orn. (Madaraz), 1884, p. 348.

♂, 3000 ft.; ♂, 5000 ft.; ♂, 8000 ft.

19. Dryoscopus cubla (Shaw).

Dryoscopus cubla, Gadow, Cat. B. Brit. Mus. viii. p. 148; Fischer, Zeitschr. ges. Orn. (Madaraz), 1884, p. 345.

♂ ♀, 3000 ft.; ♂, 5000 ft.; ♂, not labelled. The female had the irides scarlet.

20. Crateropus kirki, Sharpe.

Crateropus kirki, Fischer, Zeitschr. ges. Orn. (Madaraz), 1884, p. 316.

♂, 5000 ft.

Very common and bold.

21. Pycnonotus layardi, Gurney.

Pycnonotus layardi, Sharpe, Cat. B. Brit. Mus. vi. 1881, p. 132; Fischer, Zeitschr. ges. Orn. (Madaraz), 1884, p. 341.

♀, 3000 ft.; 2 ♀, 5000 ft.

22. Turdus cabanisi, Bp.

Turdus cabanisi, Seebohm, Cat. B. Brit. Mus. v. 1881, p. 229.

♂, 5000 ft.; ♂, 6000 ft.

The most northern locality of this species, whence it ranges southward on the east coast to the Transvaal.

Almost confined to inhabited districts.

23. Pinarochroa hypospodia, sp. n. (Plate XIII.)

Kilima-njaro, ♀, 14,000 ft.

Close to *P. sordida* (Rüpp.), which is the type of the genus *Pinarochroa*; but the present bird is slightly larger, paler and less isabelline beneath, and has the white on the tail more limited, each feather having broad blackish-brown ends.

Upper parts brown, slightly darker on the crown and quills; tail—the four outer pairs of feathers white with broad blackish-brown ends; this colour extends somewhat down their shafts, and covers about one third of the end-portion of the outer web of the exterior feather, and nearly the entire inner web of the third feather from the centre; the centre two pairs entirely black. The wing-coverts and inner secondaries are broadly edged with sandy brown, and the remainder of the quills have almost obsolete similarly coloured edges. Sides of the head in front of the eye and the cheeks slightly washed with ashy brown. Underparts ashy buff, slightly darker on the lower throat and front and sides of the chest, and passing into rufous-shaded brown on the flanks, thighs, and under tail-coverts; under surface of the wings dark brown with the coverts rufous-brown; the axillaries and inner margins of the quills ashy buff. Total length 5·7 inches, culmen 0·55, wing 3, tail 2·2, tarsus 1·25.

Found only at great altitudes, affecting the grassy and boulder regions, where they are to be seen in family parties of from three to five. Here they enliven the desert scenery by flitting before the traveller with a constantly repeated pleasing chirp, and perched upon the boulders flit their tails up and down after the manner of Chats.

24. Pratincola axillaris.

Pratincola axillaris, Shelley, P. Z. S. 1884, p. 556.

♂ ♀, 5000 ft.; 3 ♂, 6000 ft.; ♀, 7000 ft.; ♂, 8000 ft.; ♂, 10,000 ft. Breeds in September.

Very abundant but not met with below 5000 ft. They are bold, and frequent the native villages in their lower range.

25. Prinia mystacea, Rüpp.

Prinia mystacea, Sharpe, Cat. B. Brit. Mus. vii. p. 191.

Drymœca tenella, Fischer, Zeitschr. ges. Orn. (Madaraz), 1884, p. 312.

♂ ♀, 5000 ft.

26. CISTICOLA SUBRUFICAPILLA (Smith).

Cisticola subruficapilla, Sharpe, Cat. B. Brit. Mus. vii. p. 283.

♂, 5500 ft.; ♀, 8000 ft.

27. NECTARINIA FAMOSA (Linn.).

Nectarinia famosa, Shelley, Monogr. Nect. p. 13, pl. 5.

♂ in partial moult, 2 ♀, 5000 ft.; ♀, 6000 ft.; ♂ in moult, 7000 ft.

Very abundant.

28. NECTARINIA JOHNSTONI, sp. n. (Plate XIV.)

♂, Kilima-njaro, 11,000 ft.

Very similar in size, form, and colour to *N. famosa*, but readily distinguished by the pectoral tufts being bright scarlet.

Entire head, neck, back, least and median wing-coverts, and chest metallic green, with the bases of the feathers black; a small black patch from the gape to the eye. The head, neck, and back have a slight golden shade, not so strong as is generally the case in *N. famosa*, while the rump and upper tail-coverts have a bluish lustre; remainder of the wings brownish black with a slight purple gloss; the greater wing-coverts are partially edged with metallic green, shaded with bronzy-violet on a few of the outer feathers; the primary-coverts and the greater secondaries show, in certain lights, faint indications of similar metallic edges. Tail purplish black, the feathers towards the centre being narrowly and partially edged with bluish green. Axillary tufts bright scarlet; abdomen, thighs, and under surface of the wings blackish brown; under tail-coverts purplish black, with slight traces of metallic bluish-green margins to a few of the feathers. The under wing-coverts towards the bend of the wing are tipped with metallic green. Bill and legs black. Total length 10·6 inches, culmen 1·25, wing 3·3, tail 6·6, tarsus 0·7.

Very abundant. Not seen lower than 5000 or 6000 ft., but reaches higher up the mountain than any other bird with the exception of *Corvultur albicollis* and *Pinarochroa hypospodia*. Found very much round a curious teazle-like lobelia (*Lobelia deckeni*). Also at lower levels it affects the tall aloe flower-shoots.

29. NECTARINIA KILIMENSIS, Shelley.

Nectarinia kilimensis, Shelley, P. Z. S. 1884, p. 555.

Two ♂, 3000 ft.; ♂ ♀, 4000 ft.; 4 ♂, 5000 ft.; ♀, 5600 ft.; ♂, not labelled.

Found mostly near base of mountain, very common. Rarely if ever seen above 5600 ft.

30. NECTARINIA REICHENOWI (Fischer).

Nectarinia reichenowi, Shelley, P. Z. S. 1884, p. 556, pl. 51.

Drepanorhynchus reichenowi, Fischer, Zeitschr. ges. Orn. (Madaraz), 1884, p. 338.

♂, 4000 ft.; 2 ♀, 5000 ft. Never seen above 5000 ft.

Abounds in the native plantations, being, in common with most of the other Sun-birds, attracted there by the flowers of the sweet potato and of various beans and peas.

31. Cinnyris affinis, Rüpp.

Cinnyris affinis, Shelley, Monogr. Nect. p. 239, pl. 74. fig. 2.

♂, 4000 ft.; ♂, 5000 ft.; ♂, not labelled.

Very abundant at low levels.

32. Cinnyris mediocris, sp. n.

♂, Kilima-njaro, 12,000 ft.

Intermediate between *C. chalybeus* and *C. chloropygius*, but with the bill slightly more curved than in either. It resembles *C. chalybeus* in the colouring of the metallic parts, having the blue terminal collar to the throat and blue upper tail-coverts; but differs from that species and resembles *C. chloropygius* in the colouring of the abdomen, thighs, under tail-coverts, and wings, which are darker and more olive than in *C. chalybeus*.

Entire head, neck, back, least and median wing-coverts uniform metallic golden green; upper tail-coverts steel-blue; remainder of the wings dark brown, with the margins of the feathers shaded with olive; the green of the throat terminates in a narrow steel-blue collar, followed by a broad scarlet collar; pectoral tufts yellow; remainder of the underparts brownish olive, slightly washed with olive-yellow; thighs dark brown; bill and legs black. Total length 4·6 inches, culmen 0·7, wing 2·1, tail 2, tarsus 0·7.

Fairly abundant. Only remarked in upper regions.

33. Cinnyris kirki, Shelley.

Cinnyris kirki, Shelley, Monogr. Nect. p. 273, pl. 85; Fischer, Zeitschr. ges. Orn. (Madaraz), 1884, p. 339.

♂ in moult, 3000 ft.; ♂ ♀, 5000 ft.; ♀, 7000 ft.

34. Motacilla longicauda, Rüpp.

Motacilla longicauda, Rüpp. Neue Wirb. pl. 29. fig. 2.

Two ♂, 6000 ft.

35. Poliospiza tristriata, Rüpp.

Poliospiza tristriata, Heugl. Orn. N.O.-Afr. p. 642.

♀, 8000 ft. Found in small flocks.

36. Citrinella citrinelloides, Rüpp.

Citrinella citrinelloides, Heugl. Orn. N.O.-Afr. p. 644.

♀, 6000 ft.; ♂, 7000 ft.

37. Vidua principalis (Linn.).

Vidua principalis, Fischer, Zeitschr. ges. Orn. (Maradaz), 1884, p. 325.

Two ♂, 5000 ft.

38. ? Penthetria eques, Hartl.

Penthetria eques, Fischer, Zeitschr. ges. Orn. (Madaraz), 1884, p. 326.

♂, 5000 ft.; ♀, 7000 ft.

These are immature specimens or in the brown winter plumage, and can therefore only be doubtfully referred to this species.

39. Hyphantornis ocularius (Smith).

Hyphantornis ocularius, Fischer, Zeitschr. ges. Orn. (Madaraz), 1884, p. 331.

♂, 2300 ft.; ♂, 6000 ft.

40. Sycobrotus reichenowi, Fischer.

Sycobrotus reichenowi, Shelley, P. Z. S. 1884, p. 557.

Hyphanturgus reichenowi, Fischer, Zeitschr. ges. Orn. (Madaraz), 1884, p. 331.

2 ♂, 3 ♀, 5000 ft.; ♂, 6000 ft.

Breeds in colonies, especially affecting palm-trees.

41. Oriolus notatus, Peters.

Oriolus notatus, Sharpe, Cat. B. Brit. Mus. iii. p. 196; Fischer, Zeitschr. ges. Orn. (Madaraz), 1884, p. 334.

♂, 2500 ft. Irides carmine.

42. Amydrus morio (Linn.).

♂, 7000 ft.

This is a full adult male, agreeing perfectly in its measurements with Natal specimens.

Met with in small flocks of five or six. They utter a low pleasing cry or soft whistle and frequent small thickets.

43. Corvultur albicollis (Lath.).

Corvultur albicollis, Sharpe, Cat. B. Brit. Mus. iii. p. 24.

Archicorax albicollis, Fischer, Zeitschr. ges. Orn. (Madaraz), 1884, p. 336.

♂, 5000 ft.

Inhabits the whole mountain up to the snow, and breeds in August in crevices in the most inaccessible rocks.

44. Corvus scapulatus, Daud.

Corvus scapulatus, Sharpe, Cat. B. Brit. Mus. iii. 1877, p. 22; Fischer, Zeitschr. ges. Orn. (Madaraz), 1884, p. 337.

♀, 5000 ft.

More a bird of the plains than the mountainous region, where its place is taken by *Corvultur.*

45. Treron wakefieldi, Sharpe.

Treron wakefieldi, Shelley, Ibis, 1883, p. 269.

Two ♂ ♀, 5000 ft.; ♀, 6000 ft.

Seen generally in pairs, eats the sycamore-figs.

46. Palumbus arquatrix (Temm.).

Palumbus arquatrix, Shelley, Ibis, 1883, p. 283.

♂, 10,000 ft.

Bare skin round eyes, bill, and feet saffron-yellow. This specimen agrees perfectly with others from Natal. Only noticed at great attitudes from 8500 ft. to 10,300 ft. Seen in pairs in the dense forests, sometimes in company with *Turacus hartlaubi*.

47. Tympanistria tympanistria (Temm.).

Tympanistria tympanistria, Shelley, Ibis, 1883, p. 326.
Peristera tympanistria, Fischer, Zeitschr. ges. Orn. (Madaraz), 1884, p. 278.

♀, 5000 ft.

48. Francolinus schuetti, Cab.

Francolinus (Scleroptera) schuetti, Cab. J. f. O. 1880, p. 351; 1881, pl. 2.
Francolinus schuetti, Fischer, Zeitschr. ges. Orn. (Madaraz), 1884, p. 382.

♂, 6000 ft.

Frequents the rocks and was very abundant at 5000 ft. It was not met with in the plains.

49. Francolinus altumi, Fischer & Reichen.

Francolinus altumi, Fischer & Reichen. J. f. O. 1884, p. 179, pl. 2; Fischer, Zeitschr. ges. Orn. (Madaraz), 1884, p. 383.

♂, 6000 ft.

This species frequents the plains more than the mountains.

50. Ibis hagedash (Lath.).

Ibis hagedasch, Fischer, Zeitschr. gés. Orn. (Madaraz), 1884, p. 386.

♀, 3000 ft. Irides scarlet.

Shot in a marsh near Taveita out of a small flock of ten or twelve.

4. On the Insects collected on Kilima-njaro by Mr. H. H. Johnston. By Chas. O. Waterhouse.

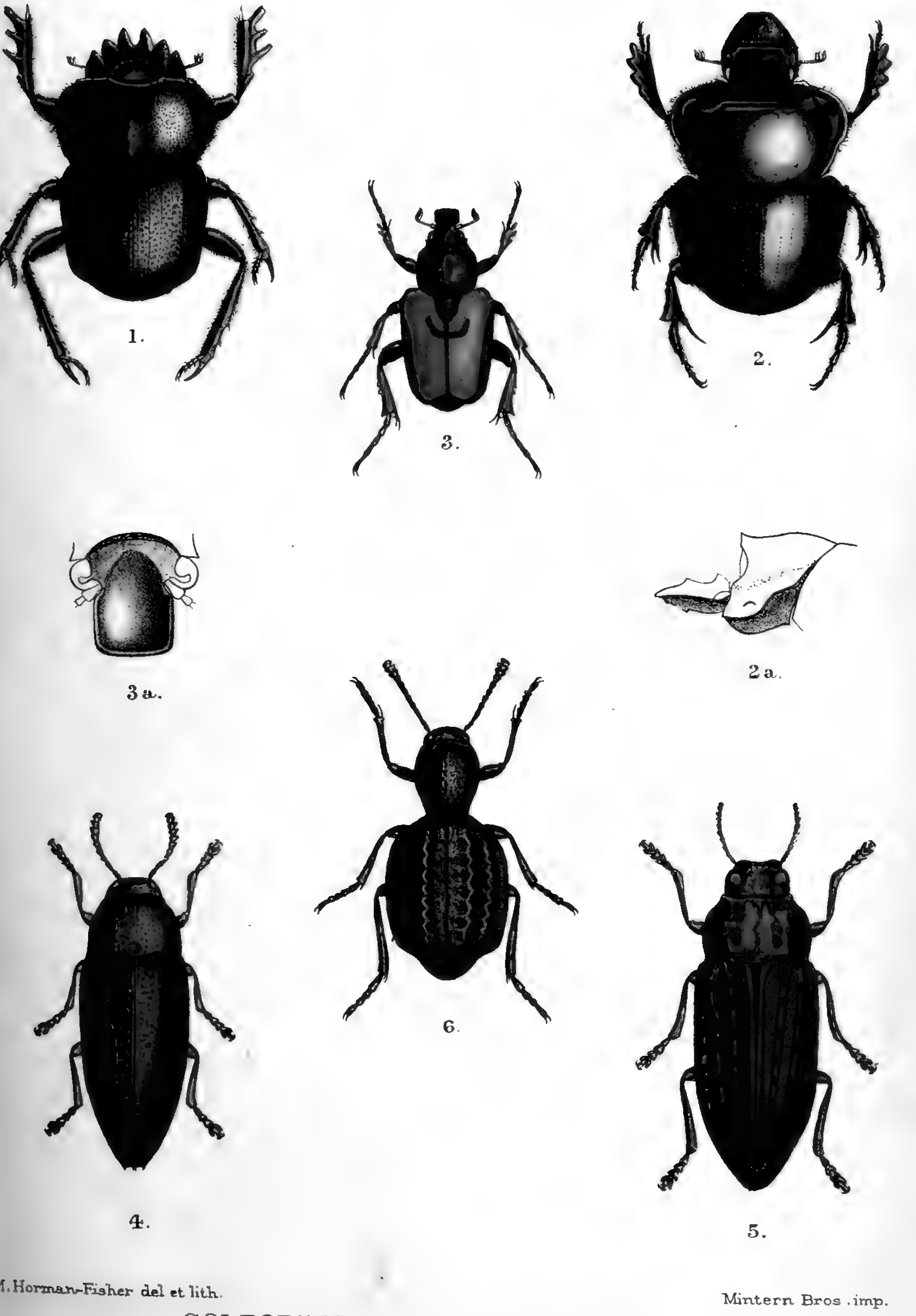
eceived February 3, 1885.]

(Plate XV.)

COLEOPTERA.

The series of Coleoptera collected by Mr. Johnston comprises examples of fifty-six species. Many of them belong to widely distributed genera and are not of special interest.

Of the nine species taken at an elevation of 10,000 to 14,000 feet the following are worthy of note:—Two examples of *Carabus*



M. Horman-Fisher del et lith.

Mintern Bros. imp.

COLEOPTERA FROM KILIMA-NJARO.

deckeni, Gerstaecker, which was described from a single female example found in this mountain. The species, however, proves to be a *Calosoma*, and not a *Carabus*, and is nearly allied to a species found in Abyssinia.

There is a single specimen of one of the Trichiidæ, which I have provisionally placed in the genus *Calometopus*, although the clypeus not being emarginate it is possible that a new genus may have to be made for its reception. I have named the species *Calometopus planatus*. There are only two species of this genus known, *C. senegalensis* and *C. nyassæ*.

The third species to which I would call attention is one of the Heteromera of the family Moluridæ. I have named it *Melanolophus ater*; it appears to be most nearly allied to *M. septemcostatus*, described by Fairmaire in Revoil's 'Faune et Flore des Pays Çomalis,' but which, if I have correctly determined it, occurs also in Abyssinia.

Of the species found at lower elevations the majority, so far as I have identified them, are only known from South-east Africa (e. g., *Melyris parvula*, Gerst., *Himatismus buprestoides*, Gerst., *Amiantus castanopterus*, Haag, *Sepidium muscorum*, Gerst., *Anomalipus heraldicus*, Gerst., *Mylabris kersteni*, Gerst., *Epicauta dichrocera*, Gerst., *Rhopalizus sansibaricus*, Gerst., *Phrissoma giganteum*, Guérin); others are found in most parts of Africa (e. g., *Calosoma senegalense*, Dej., *Oryctes boas*, Fabr.).

Of the new species which I describe, *Scarabæus cribricollis* has its nearest ally, so far as I know, in an Indian species *S. sanctus*, Fabr.; *Amblysterna johnstoni* is nearest to *A. natalensis*, Fabr.

Carabidæ.

Carabus deckeni, Gerst.

This interesting species was described by Dr. Gerstaecker (Wiegm. Arch. f. Naturg., 1867, p. 10; Von der Decken's Reise in Ost-Africa, iii. p. 56, pl. iv. f. 2) from a single female example found by Dr. Kersten on Kilima-njaro at an elevation of 8000 feet.

The two examples, male and female, found by Mr. Johnston differ from the female described by Dr. Gerstaecker in being rather smaller (only 13 millim. long), and, so far as one can judge from description, in having the elytra smoother with less impressed striæ.

Dr. Gerstaecker remarks on the fact of a species of *Carabus* being found in this locality, none ever having been found before in South Africa. The species, however, is not a *Carabus*, but a *Calosoma*, as is indicated by the compressed third joint of the antennæ; a character which Dr. Gerstaecker overlooked when he stated that the separate joints of the antennæ are formed as in *Carabus pumilio*.

Scarabæidæ.

Scarabæus cribricollis, n. sp. (Plate XV. fig. 1.)

Black, somewhat dull. Head closely and very strongly punctured, the punctures longitudinally confluent on the front of the clypeus, the anterior teeth of which are rather acute and moderately reflexed.

Thorax nearly twice as broad as long, moderately convex, with a transverse impression in the middle of the base. In the middle of the disk is a shining (but finely punctured) line, which does not extend much beyond the middle; all the rest of the surface is strongly punctured; the punctures near the shining line are a little separated from each other, but at the sides and on the fore part they are crowded together and asperate; the sides are strongly rounded, finely serrate, and fringed with black hair. The elytra are a little narrower than the thorax, very slightly narrowed posteriorly, dull, but with the suture shining; the striæ are fine, the interstices flat and finely coriaceous (except the sutural interstices and the scutellar region), with numerous dull shallow punctiform impressions placed very irregularly. Femora and tibiæ fringed with black hair. Sternum smooth and shining, with a well-marked broad impression between the intermediate legs.

Length 22 millim.

This species most nearly resembles the Indian *Scarabæus sanctus*, Fabr. The sides of the thorax are, however, more regularly rounded, much less sinuate before the posterior angles; the shining discoidal line is broader, and there are no smooth spots on each side of this line. The elytra have the striæ finer and neater, the interstices are flatter, coriaceous, with the punctiform impressions smaller and more separated from each other.

Onthophagus johnstoni, n. sp. (Plate XV. fig. 2.)

Entirely black, except the apex of the antennæ, which is rusty-yellow. Head as long as broad, obliquely narrowed in front of the middle, rounded at the apex, closely and coarsely rugose, except near the eyes. There is a slightly raised straight ridge between the eyes, and a second, longer one halfway between this and the front of the clypeus. The thorax is smooth, shining at the sides and in front, slightly dull above; the fore part is perpendicularly truncate; the truncature bounded above by a slightly prominent ridge; viewed from the front there are three shallow impressions: on each side there is a line of small tubercles bounding the discoidal area; the surface of the disk is moderately closely but extremely delicately punctured, and appears impunctate to the naked eye; the sides are more distinctly punctured: the base is oblique on each side, and is angularly produced in the middle. The elytra are convex, shining, not quite twice as wide as the length at the suture, rounded at the sides and apex, very delicately striated, the striæ delicately punctured; the interstices flat, sparingly punctured; near the suture the punctures are extremely delicate but become more distinct towards the sides. The pygidium is rather sparingly but distinctly punctured. The sides of the sterna, the margins of the femora, and the posterior tibiæ are fringed with long black hair.

Length 21–25 millim.

I know of no species which much resembles this. Its most near ally is a species which I have seen named *O. noctis*, Th., in Mr.

Bates's collection. The species has somewhat the general build of *O. marsyas*, Ol.; the head is longer, the clypeus not sinuous at the sides; the thorax rather flatter above, with a prominent, nearly straight ridge in front above the anterior perpendicular truncature; the anterior angles are as if truncated; the base is more angularly produced in the middle of the base; the elytra are scarcely narrowed at the base, &c.

TRICHIIDÆ.

CALOMETOPUS (?) PLANATUS, n. sp. (Plate XV. fig. 3.)

Nearly black; the elytra dark testaceous, with the suture, margins, and a lunate spot near the scutellum smoky black. Antennæ and tibiæ reddish yellow, the margins of the abdominal segments pale yellow. Head very closely and rather strongly punctured; the clypeus more finely punctured, a little broader than long, *not* emarginate at the apex, but slightly arcuate, the angles obtuse; all the margins reflexed. Thorax a very little broader than long, moderately convex, very strongly and rather closely punctured, parallel at the sides to considerably in front of the middle, where it is obliquely narrowed; the anterior angles nearly right-angles, very slightly prominent; the posterior angles obtusely rounded; the base gently arcuate and margined: on the disk there is a slight impression a little in front of the middle: the sides have the lateral ridge only behind the middle and at the anterior angle; the slightly swollen under flank is thus not separated from the upper surface of the thorax in front of the middle. Scutellum elongate, triangular, strongly punctured. Elytra twice as broad as the thorax, a little longer than broad; flat, with the sides nearly perpendicularly deflexed; dull, the suture and sublateral ridge shining: each elytron with six somewhat irregular dorsal lines of dark punctures; the apex closely rugulose. Pygidium closely vermiculate-strigose. Club of the antennæ a little longer than all the previous joints taken together. Body beneath and the legs sparingly clothed with yellow hair. Anterior tibiæ obtusely tridentate. The posterior tibiæ with a triangular tooth a little below the middle; the edge above this tooth with four or five small teeth. Tarsi long and slender; claws red. Abdomen shining, not very closely but strongly punctured; the basal segment yellow in the middle, margined with yellow at the sides.

Length 12 millim.

A single example was met with. It is probable that this species may have to be separated from *Calometopus* on account of the form of the clypeus, which is not emarginate. Never having seen the type of the genus (*C. senegalensis*), I am unable at present to say in what other way it differs.

BUPRESTIDÆ.

AMBLYSTERNA JOHNSTONI, n. sp. (Plate XV. fig. 4.)

Size and general form of *A. natalensis*, Fabr. Golden green, shining, the underside and legs coppery, the sides of the abdomen violet. Thorax more convex than in *A. natalensis,* more closely and much more strongly punctured; the sides more regularly arcuate, with only a very small lateral impression; the dorsal median channel well marked. Elytra very strongly and irregularly punctured, with small punctures interspersed; the punctures near the shoulders are somewhat transverse, and the interspaces being very narrow become transverse rugæ. All the large punctures are finely punctured and filled with pale pubescence, which gives the elytra a speckled appearance. The lateral and apical costæ are as in *A. natalensis,* but not so strongly marked, and there is no lateral stripe above the lateral costa. Antennæ black, with the opaque portions smoky. Underside of the body somewhat violet, the abdominal segments margined with green. Legs coppery.

Length 25 millim.

Psiloptera læta, n. sp. (Plate XV. fig. 5.)

Rather parallel, depressed, bluish green above, brassy green below. Head very rugose. Thorax nearly one third broader than long, a little broader across the middle than at the base, and then obliquely narrowed in front, with a shallow median impression and one on each side; the surface rather strongly but very irregularly punctured, coarsely rugulose-punctate at the sides; the irregular space on each side of the median impression sparingly punctured, shining coppery; and a little more removed from the middle there is an irregular-shaped coppery spot a little in front of the middle. Scutellum black. Elytra nearly parallel for two thirds their length, then narrowed to the apex, not very convex, with lines of somewhat strong punctures; the alternate interstices flat, the others in parts very slightly convex; the flat interstices are strongly and not very closely punctured; the others have each about eight ovate finely punctured impressions; the raised parts smooth and slightly brassy. At the sides there is a submarginal, closely, and finely punctured impressed line, extending from under the shoulder to near the apex; in this stripe there is some very fine whitish pubescence, which is only visible in certain lights. Prosternum with a triangular projection on each side of the front margin. Abdomen irregularly and strongly punctured, and finely pubescent.

Length 30 millim.

Moluridæ.

Melanolophus ater, n. sp. (Plate XV. fig. 6.)

Dull black. Head closely and strongly punctured, with a slight impression on the forehead. Antennæ with the 3rd joint nearly as long as the 4th and 5th taken together; the 4th joint a little longer than broad, the following joints very similar; the 10th joint the same length as the 9th, but broader than long; the 11th as broad as the 10th, but short, truncate at the apex. Thorax as long as broad, or even a trifle longer, very convex (densely and strongly punctured, the intervals irregular, shining, rugæ or granules), moderately narrowed at the base and apex; arcuate at the sides, with no lateral ridge; the front margin nearly straight, the anterior angles not prominent, the base slightly bowed. Elytra not quite twice as broad as the thorax, oblong-ovate, moderately convex; each elytron with three zigzag shining costæ (two dorsal, one lateral), the interstices plicate and rugulose; the suture not costiform. The sides of the elytra shining, the surface uneven and sparingly punctured. Prosternal process closely and rather strongly punctured; the meso- and metasterna less so. Abdomen dull, very finely punctured, the punctuation of the apical segment rather stronger. Legs rugose, *not* clothed with paler tomentum.

Length 14–15 millim.

The females are rather broader than the males, especially in the elytra, which are more oblong and somewhat flattened dorsally. The males have two very small shining spots on the disk of the thorax in front of the middle, and there is an indication of a fine median line.

I have been in doubt whether to place this species in the genus *Amiantus* or the more recent genus *Melanolophus*, Fairm. (Faun. et Fl. d. Pays Çomalis, 1882, p. 69). The general form is, however, more that of *Melanolophus*, but the suture of the elytra is not costiform. The anterior angles of the thorax are not produced forward as in *Amiantus*. The antennæ are rather shorter than in either of these genera.

HYMENOPTERA, ORTHOPTERA, &c.

The other Insects collected by Mr. Johnston do not present anything remarkable. There is, however, a very fine specimen of Mantis (*Idolum diabolicum*, Saussure), of which a male example in the British Museum is from the White Nile.

EXPLANATION OF PLATE XV.

Fig. 1. *Scarabæus cribricollis*, p. 231.
2. *Onthophagus johnstoni*, p. 232.
2*a*. Lateral view of thorax of ditto.
3. *Calometopus planatus*, p. 233.
3*a*. Front view of head of ditto.
4. *Amblysterna johnstoni*, p. 233.
5. *Psiloptera læta*, p. 234.
6. *Melanolophus ater*, ♀ p. 234.

5. Note on a Nematoid Worm (*Gordius verrucosus*) obtained by Mr. H. H. Johnston on Kilima-njaro. By F. Jeffrey Bell, M.A., F.Z.S.

[Received February 3, 1885.]

The single specimen of *Gordius* which was obtained by Mr. Johnston belongs to a well-known and widely-distributed species, but yet presents points of interest such as are almost always absent from so-called new species.

So far as my knowledge extends (and on this particular point it is in advance of that of Dr. Linstow, who, in his valuable 'Compendium der Helminthologie,' does not mention the parasite now under consideration), *Gordius verrucosus* is, in earlier life, parasitic on a species of the genus *Mantis*; and there is in the British Museum a specimen of "*Mantis*, sp.," which, as Mr. Waterhouse has been good enough to point out to me, is really *M. membranacea*, accompanying a *Gordius*. The whole of the abdomen of this Orthopteron is completely emptied of its contents. A similarly excavated *Mantis*, the appearance of which had excited Mr. Waterhouse's wonder, is to be found among the insects collected by Mr. Johnston between 3000 and 5000 feet.

A specimen, belonging apparently to the same species, is to be found half in and half out of the abdomen of *Hierodula bioculata*, a Mantid collected on the west coast of Africa, and lately presented to the Trustees by Dr. Günther, F.R.S.

With regard to the geographical distribution of the species, it is to be noted that it is sufficiently wide to include South Africa and Ceylon; while there are in the British Museum specimens named respectively by Dr. Baird, the author of the species, and by Dr. Örley, who in 1881 went carefully through the collection in the Museum; these specimens are reported as coming from Vera Paz, Guatemala (presented by O. Salvin, Esq.), and the "neighbourhood of Irazu, Costa Rica" (presented by Messrs. Godman and Salvin). The fact that the same parasite is to be found in hosts of different species is well known. The present case, in which *Mantis membranacea* from Ceylon, *Idoleum diabolicum* from Kilima-njaro, and *Hierodula bioculata* from West Africa are infested by a common form, is almost exactly paralleled by the case of the *Tænia* described by Peters from a Rhinoceros from the Mozambique, and by Murie and Garrod in Rhinoceroses from India.

As to the second point which has arisen, the presence of *G. verrucosus* in Central America, I note differences in the form of the integumentary papillæ, which are sufficient to induce me to suggest that no stress should be at present laid on this point, though they are not enough, when taken in conjunction with my own want of experience in the degrees of possible variations, to lead me to put myself into more decided opposition to the views or determinations of such workers as Dr. Baird and Dr. Örley.

6. Description of a new Variety of River-Crab, of the genus *Thelphusa*, from Kilima-njaro. By E. J. Miers, F.L.S., F.Z.S.

[Received February 3, 1885.]

The species of *Thelphusa*, or River-Crabs, are extremely numerous, and their discrimination is often very difficult, on account of the changes which the species undergo as they increase in age and size.

In the collection brought by Mr. H. H. Johnston from Kilimanjaro are two specimens of this genus, which I assign, though not without some hesitation, to the *Thelphusa depressa*, Krauss, described from types taken near Pietermaritzburg, Natal. They agree with the description and figure in their depressed carapace, which is considerably dilated at the branchial regions, in the non-development of the lateral epibranchial tooth, and in other essential characters; but differ in the more strongly defined cervical suture of the carapace, and the more strongly denticulated merus, and much less strongly arcuated dactylus of the chelipedes. As regards this latter character, I may observe that in a series of *Thelphusæ* (perhaps *T. difformis*) in the Museum collection, the dactyli of the chelipes are in some males arcuated, and in others nearly straight.

I append a detailed description of the specimens from Kilimanjaro, which I propose to designate *T. depressa*, Krauss, var. *johnstoni*, but which may prove to belong to a distinct species.

Thelphusa depressa, Krauss, var. johnstoni.

Cf. *Thelphusa depressa*, Krauss, Südafrik. Crustaceen, p. 38, pl. 11. fig. 4 (1843).

Carapace transverse, widest in its post-frontal region, depressed, with the dorsal surface nearly smooth, and divided into two nearly equal portions by the zigzag cervical suture, which extends transversely across the carapace to the postero-lateral margins; behind this a second transverse depression (not a suture) crosses the carapace behind the cardiac region. The postfrontal crest extends to the antero-lateral margins of the carapace, and is interrupted only by the meso-gastric suture, which bifurcates posteriorly (as usual in the genus); this crest is granulated near to the antero-lateral margins, which are defined by a distinctly granulated line; the lateral epibranchial teeth are not developed. On the hepatic and branchial regions are several faintly indicated lines, which extend inward for a short distance over the dorsal surface of the carapace from the lateral margins. The front is about one third the width of the carapace, punctulated above, with its anterior margin sinuated, its antero-lateral angles obtuse and not prominent. The orbital margins are entire, and defined by a raised line, which is granulated except near to the front; the inferior orbital margin is regularly arcuate, not (as in *T. perlata*) angulated near to the interior subocular lobe, which is not at all prominent; the tooth, also, at the exterior orbital angle is very little developed; the parts of the carapace adjoining the antero-lateral angles of the buccal cavity are very distinctly granulated. The eye-peduncles are slender (for a species of this genus), and the eyes do not attain the exterior angle of the orbit. The exterior maxillipedes are formed as in *T. perlata*, having the ischium and merus of the endognath distally truncated, the merus rounded at its antero-external angle, and scarcely emarginate at its antero-internal angle. The chelipedes in the adult male are unequal, the right the larger; in both the merus is armed with a series of spinules on the anterior margin, and with a somewhat longer spine near the distal extremity; the carpus with a spine followed by a smaller spinule on the inner margin; the palm is somewhat compressed and nearly smooth, rounded above; the dactyl and pollex are denticulated on the inner margins, and have between them, when closed, a rather narrow interspace; the dactyl is slightly arcuated and as long as, or rather shorter than, the palm. The ambulatory legs are of moderate length, with the fourth to sixth joints compressed, and with the superior margins acute; the margins of the penultimate joints near to the distal extremity and the dactyli are armed with small spinuliform teeth, which on the dactyli are disposed in four longitudinal series.

Adult male.

	lines.	millims.
Length of carapace	$17\frac{1}{2}$	37
Breadth of carapace about	$25\frac{1}{2}$	54·5
Length of a chelipede	44	93·5

This form may be distinguished from other African species in which the postfrontal crest is distinctly developed, by the following characters:—From *T. perlata*, M. Edw., which is found at the Cape and Port Natal, by the wider transverse carapace, which is more dilated at the branchial regions, and not dorsally granulated near the antero-lateral margins, and by the form of the orbit, whose inferior margin is regularly concave (not as in specimens referred to *T. perlata* in the Museum Collection), abruptly angulated near the interior subocular lobe. From *T. inflata*, M. Edw., by the less convex carapace, straight postfrontal crest, and the granulated line which borders the antero-lateral margins of the carapace. *T. aubryi*, M. E., *T. africana*, A. M. E., and *T. emarginata*, Kingsley, from the Gaboon, West Africa, and Port Natal, have an additional tooth between the exterior angle of the orbit and the postfrontal crest. In *T. goudoti*, M. E., from Madagascar, the postfrontal crest is less developed, and the immobile finger of the chelipedes forms more or less of an angle with the inferior margin of the palm. Another species from Madagascar, *T. madagascariensis*, A. M. E., which has not, I believe, been figured, is distinguished by the lesser development of the postfrontal crest and the straighter fingers of the chelipedes, which meet along their inner margins. In the West-African *T. bayoniana*, *T. anchietæ*, and *T. dubia*, Brito Capello, the lateral epibranchial tooth is more developed. In

T. limula, Hilgendorf, from Senegambia, the postfrontal crest is less distinctly developed near the lateral epibranchial teeth, behind which, in the males, are indications of two other teeth.

7. On the Heart described by Professor Owen in 1841 as that of *Apteryx*. By E. Ray Lankester, M.A., LL.D., F.R.S., Jodrell Professor of Zoology in University College, London, Fellow of Exeter College, Oxford.

[Received February 19, 1885.]

When busy some three years ago with the examination of the right cardiac valve of *Ornithorhynchus* and *Echidna*, I was naturally anxious to examine the similar valve of *Apteryx*, which had been stated by Sir Richard Owen to present a divergence from the character which it usually presents in Birds, and instead of being purely muscular as in all other Birds, to possess membranous areæ and chordæ tendineæ. Sir Richard Owen gives the following account of this valve in his paper published in 1841, in the 'Transactions' of this Society (vol. ii. p. 272):—

"The principal deviation from the ornithic type of the structure of the heart is presented in the valve at the entry into the right ventricle (pl. lii. *g*. fig. 3). This is characterized in birds by its muscularity and its free semilunar margin. In the *Apteryx* it is relatively thinner, and in some parts semitransparent and nearly membranous; a process moreover extends from the middle of its free margin, which process is attached by two or three short *chordæ tendineæ* to the angle between the free and fixed *parietes* of the ventricle. We perceive in this mode of connection an approach in the present bird to the mammalian type of structure analogous to that which the *Ornithorhynchus*, among *Mammalia*, offers, in the structure of the same part, to the class of birds; for the right auricular ventricular valve in the *Ornithorhynchus* is partly fleshy and partly membranous. The dilatable or free *parietes* of the right ventricle were about $\frac{1}{20}$th of an inch in thickness, those of the left were $\frac{1}{6}$ th of an inch thick."

I was fortunately able to gratify my curiosity with regard to the heart of *Apteryx* by the dissection of a specimen preserved in spirit, which I owe to the courtesy of Mr. Cheeseman.

I was not a little astonished to find that the right cardiac valve of my *Apteryx* was totally different from that described by Owen, and so far from presenting any membrane or chordæ tendineæ, exhibited the normal structure of the right cardiac valve in birds; in fact was a purely muscular lobe. I put the matter by at that time, and was reminded of it a few weeks since by Mr. Beddard, who told me that he had obtained a precisely similar result to my own from the examination of a specimen of *Apteryx* which had recently come into his possession.

Mr. Beddard further told me that he had taken an opportunity of looking at Owen's specimen of the heart of *Apteryx*, which is now in the Museum of the Royal College of Surgeons, No. 923 B. b. and that it certainly differed altogether, as regards its right cardiac valve, from an ordinary bird's heart, and from the *Apteryx*-heart dissected by him. Mr. Beddard remarked, as Owen had done himself, that the valve in this specimen in the College of Surgeons was very similar to the right cardiac valve of the Monotremata.

It occurred to me that possibly Sir Richard Owen had made an unfortunate mistake at the time of dissecting his *Apteryx*, and that since he had at the same time specimens of *Ornithorhynchus* under examination, side by side with the *Apteryx*, the heart of one of the latter might, by the inadvertency of some assistant or attendant, have been exchanged for the heart of the former.

Accordingly on Feb. 18th I requested Prof. Charles Stewart to allow me to remove from its bottle, and closely examine the specimen 923 B. b., labelled "Heart of *Apteryx australis*" (so placed and labelled, so far as I have been able to ascertain by inquiry, under the direction of Prof. Owen).

The figure in the Society's 'Transactions' does not represent the appearance of this heart, inasmuch as three musculi papillares are figured, and are described as "chordæ tendineæ," whilst only two (the great anterior and the right) are obvious in the preparation. That is, however, a matter of detail which Prof. Owen regarded as liable to variation, since he says that two *or* three chordæ tendineæ are present, and in his paper on *Apteryx* he speaks of having dissected *two* specimens.

On removing the heart from the bottle in Prof. Stewart's presence, I was able to point out to him that the aortic arch of this supposed heart of *Apteryx* has a *sinistral* and *not* a *dextral* flexure. I also found that the auricles and the relatively small jugular sinus are identical with that of *Ornithorhynchus*, and unlike the auricles and large veinous sinus of any bird. I found, further, that the arrangement of muscle and membrane in the right cardiac valve is precisely (not only approximately) similar to that described by me in *Ornithorhynchus*, and figured in the 'Proceedings' of the Society for 1882, pl. xl., and also in 1883, pl. iii.

The shape of the whole heart, the shape of the right ventricular cavity, and the markings of its surface (rudimentary columnæ carneæ) are precisely of the same character as in the nine specimens of *Ornithorhynchus*-hearts examined by me.

I have no hesitation in stating that the heart, specimen No. 923 B. b., in the Museum of the Royal College of Surgeons, is *not* the heart of an *Apteryx*, but the heart of an *Ornithorhynchus paradoxus*.

This being the case, the discrepancy between the observations made independently by Mr. Beddard and by me upon the structure of the right cardiac valve of *Apteryx*, when compared with the statements made forty years ago by Sir Richard Owen, is accounted for. Sir Richard Owen did not examine the heart of *Apteryx*, but by an accident occupied himself with the heart of an *Ornithorhynchus* which he mistook for the heart of that bird.

8. On Races and Hybrids among the Salmonidæ.—Part IV. By Francis Day.

[Received February 17, 1885.]

In continuation of the series of papers upon "Races and Hybrids among the Salmonidæ," which I have communicated to this Society, I propose to resume my account of the Howietoun experiments from November 1884 until the present time. This period has been most instructive, as comprising the period during which the ova of the hybrids have been incubating; it has also demonstrated that we must not be too confident, should the eggs of two-year-old fish fail to hatch, that such failure is not due to the immaturity of the parents.

Respecting the hybrids between the Lochleven-Trout eggs and Salmon-smolt made December 24, 1881, those fish which have remained in the Octagon pond at Craigend[1] do not appear to have bred, neither have they much increased in size. On February 12 one was taken with a fly: it measured $9\frac{1}{2}$ inches in length, was in fair condition, and on being opened proved to be a barren male. Its form was similar to what I have previously described these fish to be. There were seven large black spots on the opercles on the right side and eight on those of the left; a row of red spots along the lateral line and a second series above it. Fins edged anteriorly with white, the dorsal with several irregular rows of black spots. A slight appearance of par-bands when in certain lights. Taken in conjunction with the largest similarly bred hybrid two years older than this lot, which was found in November 1884 to be merely $16\frac{1}{2}$ inches long[2], the supposition is raised that the breed may be a dwarfed one.

The young hatched in 1884 from Lochleven-Trout eggs and young Salmon-par, which produced "dropsies,"[3] are still in one of the large boxes at Howietoun. The water was too discoloured to allow of their being visible: a few were obtained by means of a landing-net; but they do not appear to have much increased in size.

The first experiment made with the eggs of a Grilse[4], which had been reared from eggs hatched at the Howietoun fishery, was on November 7, 1884, when about 100 were obtained by Mr. Thompson from one of these fish that had jumped out of the pond, and which were milted from a Lochleven Trout. On January 3, 1885, 18 hatched; and when I saw them on February 10 they were looking very well, and none of them appeared to be suffering from any deformities. Particular attention must be drawn in this place to the age of the Grilse, which had been hatched early in 1881 from ova and milt obtained from the Teith in December 1880. The fact of these young fish being in their third winter season has probably much influence on the success of their hatching.

Prior to discussing the results of incubation in the ova of the

[1] Proc. Zool. Soc. 1884, p. 584.
[2] *L. c.* p. 584.
[3] *L. c.* p. 583.
[4] *L. c.* p. 582.

rising two-year-old hybrid fishes, a very important fact must not be overlooked. Last season, 1883–84, it was observed that, although young Salmon-par at just over two years of age could fertilize the ova of Trout, the alevins were dropsical, and only about 100 out of 4000 survived. So the experiment was altered this season; and a young Lochleven Trout rising two years of age was employed to supply the eggs which were milted from an adult of her own race.

November 13, 1884.—About 500 eggs were obtained from a rising two-year-old Lochleven Trout, their average size being 0·17 of an inch in diameter (at 8 years old they are from 0·20 to 0·24 of an inch); these were impregnated from a male of average size and of the same race. The eggs were placed in box 124 *b*; and it was observed that besides being small, they had a much thinner shell than had those of older fish. The eggs did very badly, and only about a dozen hatched. This experiment is of very great value, as tending to show that small eggs taken from young mothers have a deficiency of vitality in a similar manner to the milt of the young males.

On December 9, 1884, about 400 ova were taken from a Howietoun Grilse and milted from a Lochleven Trout. The diameter of the eggs was 0·22 inch; and they were placed in tray 108 *b*. Only about half the eggs appear to have been impregnated.

December 13.—500 eggs were obtained from a dead Sea-Trout which had met its death from direct injury, a wound having extended into the ovary, and possibly water had then obtained entrance. To these eggs the milt of a Salmon par, reared at Howietoun, was added; and they were deposited in box 84 *c*. The size of the eggs was 0·18 inch in diameter. Probably none will hatch.

December 13, 1884.—650 eggs were obtained from a Sea-Trout, and having been impregnated from a Lochleven, they were placed in tray 84 *b*. The size of each egg was 0·18 inch in diameter.

November 11, 1884.—About 12,000 eggs of the Lochleven Trout were milted from a Howietoun-reared smolt, and laid down in box No. 1. These eggs have done very well, only about 87 dead ones having been picked out; they hatched on January 28, and the young look well. In this experiment neither parent was under the third season.

November 14, 1884.—About 800 eggs of the Lochleven Trout were milted from three Howietoun-reared pars and smolts. These eggs were placed in box 96 *a*. They hatched on February 5; the young are numerous, and appear to be very healthy. The remark on the age of the parents in the last experiment also may be applied to this.

On November 12, 1884, 1350 eggs of a Lochleven Trout were milted from a hybrid Char and Trout[1], this hybrid being $8\frac{1}{2}$ inches in length. The eggs were placed in box 92 *a*; only about 12 eyed, and out of these 3 embryos came to their full size, but had not sufficient vitality to burst their shell, dying unhatched. As a rule, the eggs appeared not to have been impregnated. On measuring

[1] Proc. Zool. Soc. 1884, p. 586.

J Smit lith

Hanhart imp

FELIS LEOPARDUS, *var melanot*

the eggs, I found that the majority averaged 0·24 inch in diameter. The cause of the failure in this instance may probably have been more due to the young age of the male (a rising two-year-old) than to its being a hybrid. Next winter, however, ought to set this question at rest.

November 12, 1884.—A female rising two-year-old hybrid Char of the Struan[1] race gave 146 eggs, out of which only six hatched on February 3, 1885.

November 12, 1884.—4500 eggs of Lochleven Trout were milted from a hybrid rising two-year-old of the Struan race; they hatched on February 2, 1885. Among them are many deformities, a few dropsies; while about half the ova hatched.

Respecting the rising Struan two-year-old hybrids[2], they have suffered from the winter more than any other form. Kept in plank-pond no. 4, as December set in they began to be languid; and one or two having died, they were shifted into the old *fario* pond, no. 5, on Dec. 24, when 74 fish were transferred. The next day 15 died, and two on the 26th. Since then a few have succumbed; and one on Feb. 12. These fish seem, in their shallow pond, to have felt atmospheric changes very severely, requiring deeper water into which to descend, while it is very remarkable that the hybrid crosses between the American Char and the Lochleven Trout (9 leopards and 146 zebras) were not so affected, although kept under precisely similar surroundings.

In continuation of the table of measurements of the eggs[3] of Grilse, Lochleven Trout, American Char, and those of the Struan hybrids which I gave in my last paper, I have the following additional ones to record:—

Salmo salar, 16 lb. weight:	diameter of each egg 0·24 of an inch.		
,, ,, Howietoun Grilse:	,,	,,	0·20 to 0·22 of an inch.
,, *trutta*, small:	,,	,,	0·175 to 0·18 of an inch.
,, *levenensis*, 8 years old:	,,	a few 0·20, 0·22, most 0·24 inch.	
,, ,, 2 ,,	,,	each egg 0·17 of an inch.	
,, *fontinalis*, 3 ,,	,,	,,	0·17 of an inch.
,, ,, 2 ,,	,,	,,	0·14 to 0·16 of an inch.
Hybrid Char, Struan race	,,	,,	0·15 of an inch.

9. Note on a supposed Melanotic Variety of the Leopard, from South Africa. By Dr. A. Günther, F.Z.S.

[Received March 3, 1885.]

(Plate XVI.)

A few days ago Mr. F. Bowker brought to me the flat skin of a "rare Leopard" which he had obtained at Grahamstown. The animal had been killed in a hilly district covered with dense scrub and situated at a distance of about forty miles from the town. On further inquiry I learned that a second specimen had been obtained in

[1] Proc. Zool. Soc. 1884, p. 587. [2] *L. c.* p. 586. [3] *L. c.* p. 588.

the same district, and is at present preserved in the Museum of Grahamstown[1]; that the ordinary kind of Leopard is common in the locality, that the Cheetah is very scarce, and that the Lion has been entirely exterminated for a considerable period.

The points in which the skin differs from the ordinary type are the following:—

The ground-colour is tawny with a rich orange gloss about the shoulders. Of the rosettes only a few indications are preserved, namely on the haunches, where two are visible on the right side, whilst they form an irregular confluent pattern on the left. Remains of rosettes are also visible, one on each shoulder close to the verticelli of hairs which are usually developed in this place in the Leopard, Lion, &c. Two pairs of similar rudimentary rosettes succeed these at intervals of about 10 inches. The remainder of the rosettes are broken up into, or replaced by, innumerable small separate spots, which are most distinct in and behind the region of the shoulder, and on the outer sides of the legs. They are more diffuse on the flanks, where they mix with the ground-colour, producing a brownish tinge. Finally on the back, from the forehead to the sacral region, they are more or less confluent, so that the whole of the back appears to be of black colour, which is most intense above the lumbar region. A few black spots on the upper lip, a conspicuous black spot above each eye surrounded by a light yellowish ring, and a large black spot on the back of the ear are present as in Leopards with typical coloration. On the other hand, the tail differs in a remarkable manner, it being fulvous for its first two thirds, which colour gradually changes into pale grey; the whole tail is sprinkled with numerous very small and clearly defined spots, the extreme tip being black. Chin, chest, belly, and inside of the legs white with large black spots as in the ordinary Leopard. Whiskers and claws white, hair between the foot-pads black. The hairs are of about the ordinary length, with a very thick underfur on the sides of the body.

The measurements of the flat skin are as follows:—Head and body 4 feet 1 inch, tail 2 feet 6 inches; distance of central line of back from the fore toes 2 feet 6 inches.

In endeavouring to throw some light on this extraordinary deviation from the ordinary type, we are almost entirely limited to the evidence to be gleaned from the specimen before us. The possibility of its being a hybrid between the Leopard and one of the other large feline animals of South Africa is to be considered. There is a very evident mixture of two patterns of coloration, viz. of that in which the ornamental colour appears in the form of rosettes, and that of simple black spots as in the Cheetah. Yet the whole build of the animal and the structure of the typically feline claws prevent us from assuming that the Cheetah might be one of the parents. It would be more within the bounds of possibility that our specimen is the offspring of a Leopard with a Lioness which had

[1] This is evidently the same specimen which was described by Mr. Trimen in Proc. Zool. Soc. 1883, p. 535.

strayed so far southwards, the African Lion being frequently found with a very dark dorsal region and with the long hairs of a more or less intense black; also the bright tawny ground-colour of the shoulder in our specimen is very Lion-like. But it would be extremely hazardous to found an opinion on such slight grounds, the more so as we cannot find any trace of structural leonine characters.

The hairs consist of a soft underfur of fine wool-hairs, mixed with stouter hairs; the latter cannot be distinguished microscopically from those of the ordinary Leopard; and both are almost identical with, perhaps a little more slender than, those of the Lion.

It is a well-known fact that the Asiatic Leopard exhibits a decided tendency to melanism; and it is stated that the black Leopards are found chiefly in forest-districts of considerable elevation. So far the conditions under which melanism appears in the Asiatic Leopard seem to be similar to those under which our specimen was reared. On the other hand, the abnormal coloration affects the ornamental pattern of the Asiatic Leopard in a different fashion from that observable in our specimen. In the former the black colour is equally diffused over the whole body, the rosettes retaining their shape and number, and shining with a more intense black through the ground-colour. This is a very different pattern from that of our specimen. Nevertheless, considering all circumstances, I have no better opinion to offer than this, that the specimen is an instance of incipient melanism—the first appearance of the melanotic tendency which is so strongly developed in Asiatic individuals of this widely spread species.

March 17, 1885.

Prof. Flower, LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of February 1885:—

The total number of registered additions to the Society's Menagerie during the month of February was 48, of which 20 were by presentation, 14 by purchase, 7 by birth, 2 were received in exchange, and 5 on deposit. The total number of departures during the same period, by death and removals, was 105.

The most noticeable additions during the month of February were as follows:—

1. A Viverrine Phalanger (*Phalangista viverrina*) from Australia, purchased February 10th, being of a species new to the Society's Menagerie.

2. An Isabelline Lynx (*Felis isabellina*), received in exchange from the Zoological Gardens, Calcutta, February 27th. This animal has been placed in company with the example of the same species presented in 1882 by Capt. Baldock (see P. Z. S. 1882, p. 720), with which it seems to agree in every respect.

3. Two young examples of the American Brown Pelican (*Pelecanus*

fuscus), purchased February 28th. The acquisition of these birds renders the Society's series of Pelicans very nearly complete, as we now have specimens of seven species living in the Gardens, as will be seen by the subjoined list.

List of Pelicans now living in the Gardens.

4 White Pelicans (*Pelecanus onocrotalus*).
- *a.* Presented by E. T. Rogers, Esq., C.M.Z.S., Feb. 3, 1868. From Syria.
- *b.* Presented by A. C. Henderson, Esq., April 25, 1877.
- *c.* Presented by J. Simonds, Esq., June 6, 1880.
- *d.* Presented by C. J. Bolau, Esq., June 2, 1882.

1 Mitred Pelican (*Pelecanus mitratus*).
- *a.* Presented by Dr. Holub, Sept. 18, 1879. From S. Africa.

1 Crested Pelican (*Pelecanus crispus*).
- *a.* Presented by Dr. Dagle, April 10, 1873.

1 Red-backed Pelican (*Pelecanus rufescens*).
- *a.* Purchased, July 21, 1880.

2 Brown Pelicans (*Pelecanus fuscus*).
- *a, b.* Purchased, Feb. 28, 1885.

1 Rough-billed Pelican (*Pelecanus trachyrhynchus*).
- *a.* Purchased, July 3, 1884.

1 Australian Pelican (*Pelecanus conspicillatus*).
- *a.* Purchased, May 14, 1868.

I may remark that most of these birds are now in fine breeding-plumage, and that the Rough-billed Pelican (to the shedding of the upstanding plate on the culmen of which I called attention on a former occasion [1]) has now developed a new knob on its beak.

I have also to call your attention to a fine example of a species of Bird-Spider which has been for some time in the Society's Insect-House, and has within these few days been presented to the Society by Mr. H. R. P. Carter, of Madras. It was found in a teak-log, and is believed to have come from Burmah. Mr. O. P. Cambridge, who has examined the drawing of it (which I now exhibit), believes it to be referable to *Mygale fasciata*, Latr., Koch, 'Die Arachniden,' Band ix. p. 41, Plate ccci. fig. 717.

Mr. Sclater exhibited and made remarks on a curious Duck shot on Lord Bolton's estate in Yorkshire in January 1885, which was apparently referable to the Common Scaup (*Fuligula marila*), but was remarkable for having the broad and clear white front of the female, and the black head of the ordinary male of this species.

Mr. W. B. Tegetmeier exhibited and made remarks on a pair of abnormal antlers obtained in India, said to be those of the Sambur (*Cervus aristotelis*).

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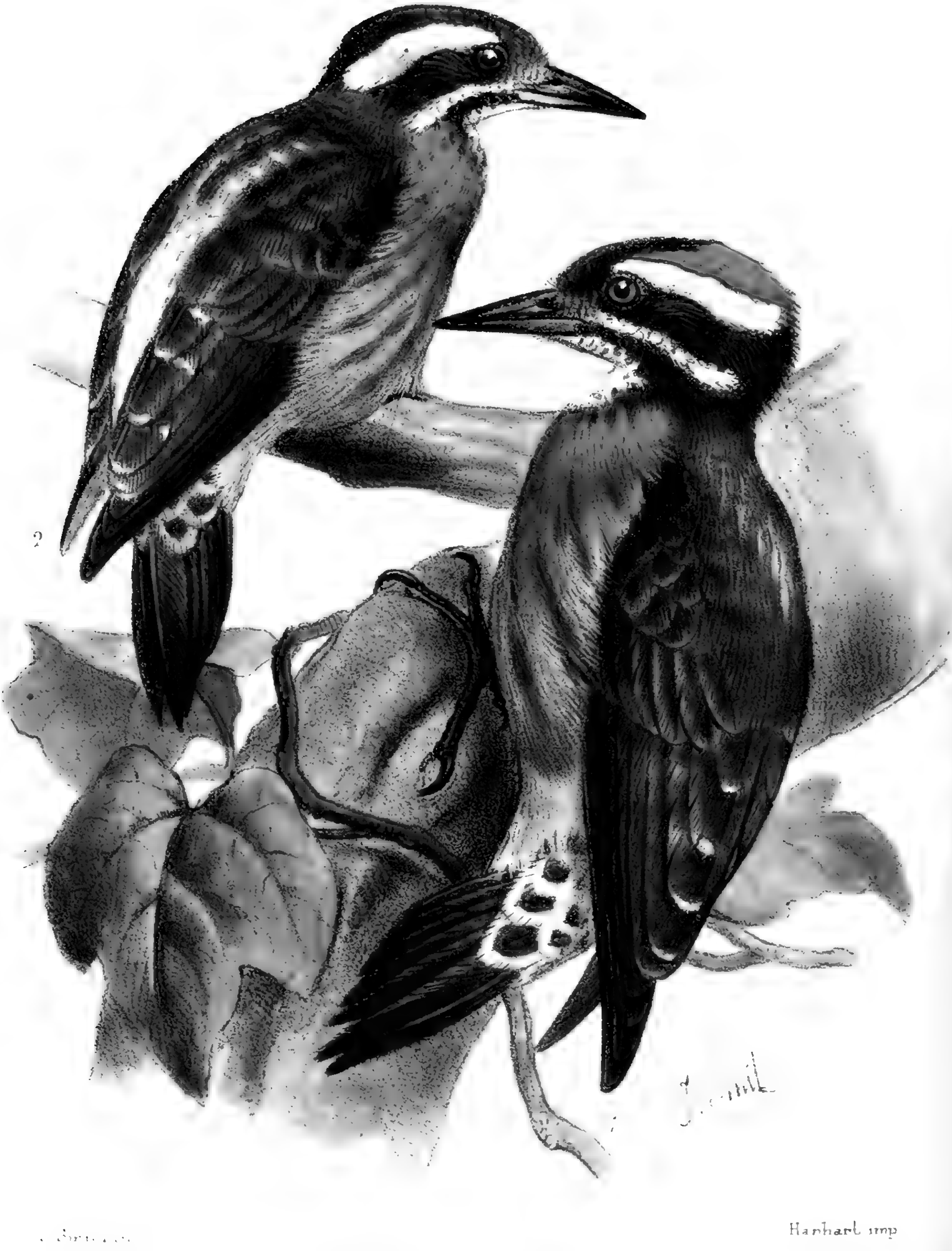
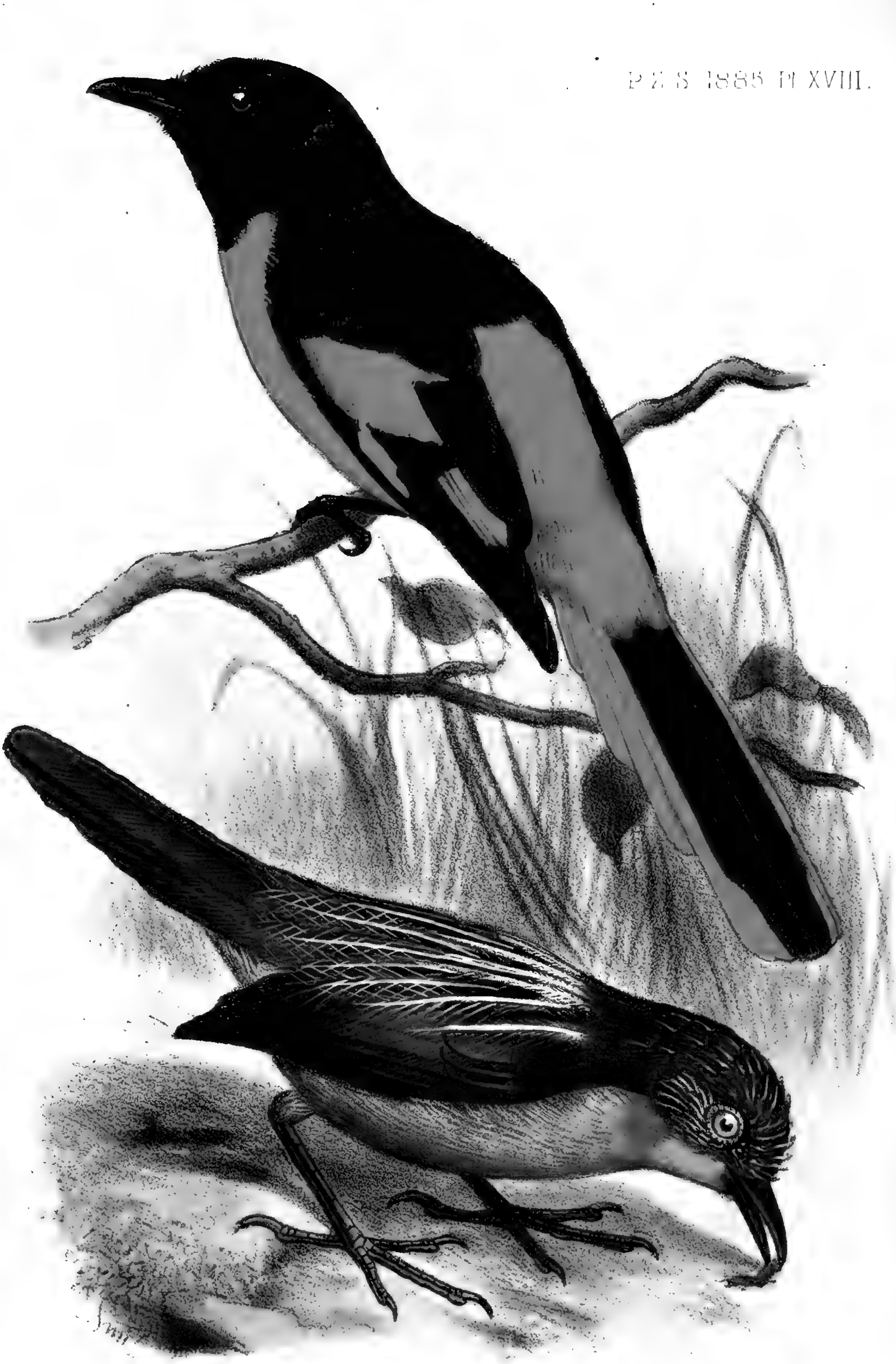
[1] See P. Z. S. 1884, p. 410.



Hanhart imp

IYNGIPICUS RAMSAYI. 1 ♂ 2 ♀



J. Smit lith. Hanhart imp.

1. PERICROCOTUS MARCHESÆ.
2. MACRONUS KETTLEWELLI.

Professor Bell exhibited examples of two species of Phytophagous Coleoptera (*Aspidomorpha sanctæ-crucis* and *A. milaris*) from Bombay, to illustrate the difference in coloration of living and dead examples.

The following papers were read:—

1. Report on the Collections of Birds made during the Voyage of the Yacht *Marchesa*.—I. A Provisional List of the Birds inhabiting the Sulu Archipelago. By F. H. H. Guillemard, M.A., M.D., F.L.S., &c.

[Received February 13, 1885.]

(Plates XVII. & XVIII.)

The Sulu Archipelago, a group of islands lying between the Philippines and the extreme north-east point of Borneo, has been, until quite lately, almost a *terra incognita* to naturalists. The difficulties of navigation, owing to the numerous reefs and shoals, the dangerous currents, and lastly, but by no means least, the possibilities of a *rencontre* with pirates, rendered a visit to the islands a somewhat hazardous experiment in former times. Lately, however, the facilities for exploring them have much increased. One of the results of the formation of the new North Borneo Company has been the opening of steam communication between their territory and Sulu Island. Recent surveys have lessened the dangers of navigation, and, though pirates still exist, even in these latter days of civilization, they confine their operations chiefly to small and unarmed praus.

Ornithologically speaking, the island of Basilan has always been regarded as one of the Philippines. Lord Tweeddale incorporated it as such in his "List of Birds known to inhabit the Philippine Archipelago" (Tr. Z. S. vol. ix. part 2); while Mr. Sharpe, in a paper on the Birds of the Sulu Islands, followed his example by omitting all notice of Mr. Everett's collection formed at Isabela de Basilan. But in many geographical publications it forms part of the Sulu Archipelago, and the line of separation between the latter and the Philippine Islands is drawn to the south-west of Mindanao. Such a line, however, has neither a political nor zoological *raison d'être*. The Sultan of Sulu has no authority in Basilan, and though the Spaniards had doubtless other than scientific reasons for including Sulu in their charts as belonging to the *Archipielago Filipino*, I hope to show in this paper that they are so far borne out, in that the Ornis of the group appears to be almost purely Philippine.

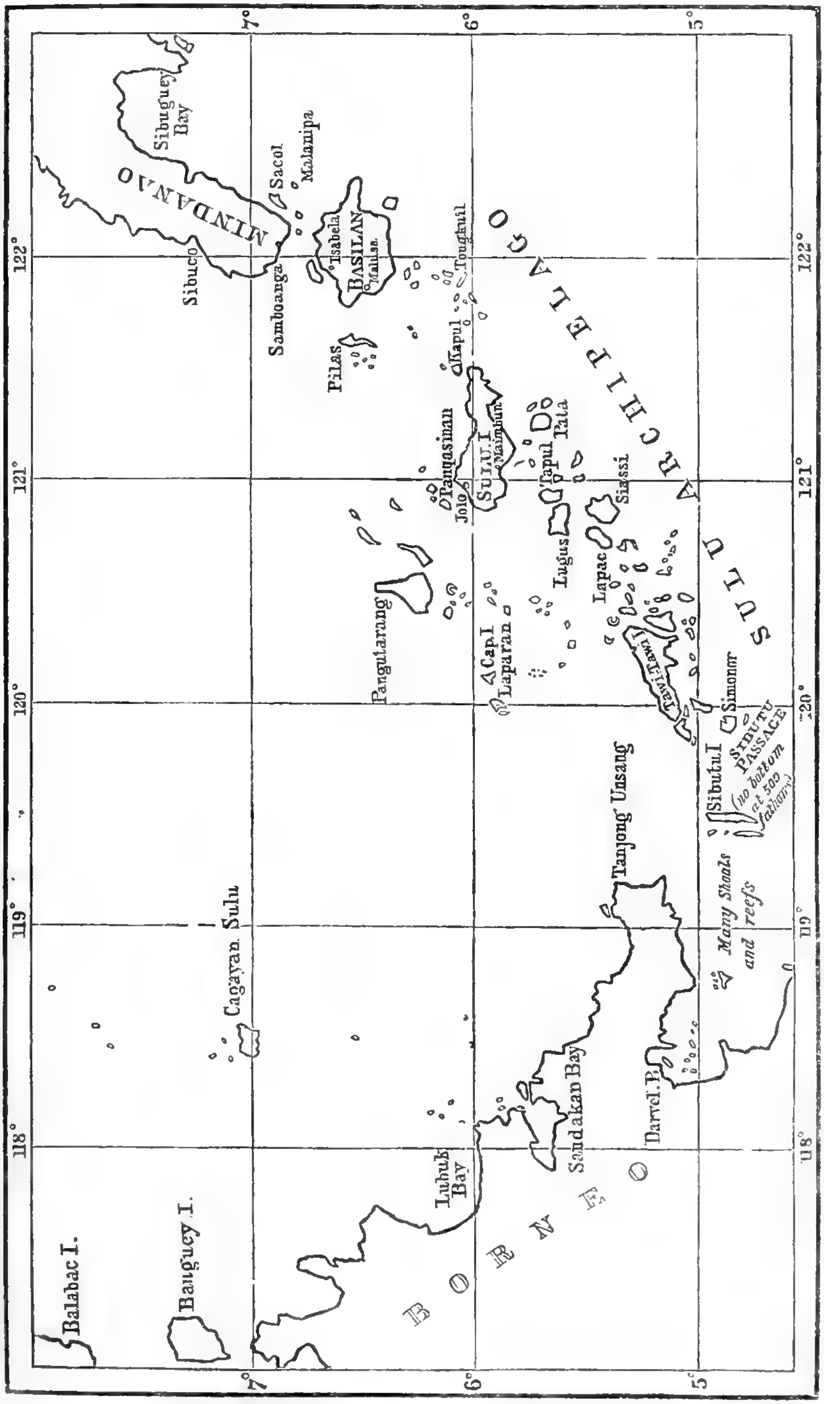
Mr. Sharpe, in the paper already alluded to (P. Z. S. 1879, part 2), gave a list of all the Sulu birds known at that date, chiefly from a small collection made by Mr. Burbidge on the island that has given its name to the Archipelago. To this I have been able to add considerably. On the 20th of April, 1883, I arrived at Sulu Island in Mr. Kettlewell's yacht 'Marchesa,' then on her way to New Guinea, and stayed there over a month, calling again at the group for a few days on our return journey. During these two visits our party collected over the whole of the western half of Sulu Island, and also visited Pangasinan, Lapac, Siassi, and Tawi-tawi, though, owing to our limited time on these latter islands, we were unable to obtain many specimens. Our total collection numbered over 200 individuals of 60 different species.

The total number of species recorded by Mr. Sharpe from the Sulu group is 20. These I have had to reduce by four—*Cuculus fucatus, Carpophaga pickeringi, Calœnas nicobarica,* and *Gallus stramineicollis.* The three first are given on the authority of Cassin, who records them as from "Mangsi, one of the Sooloo Islands." This has naturally led Mr. Sharpe astray. Mangsi, though no doubt originally under the jurisdiction of the Sultans of Sulu, who used at one time to own a considerable portion of Borneo, is not one of the Sulu group at all, but is an island off the N. coast of Borneo, lying between Banguey and Balabac. It is 200 miles from the nearest island of the Sulu Archipelago, and its avifauna is doubtless directly derived from the adjacent mainland. *Gallus stramineicollis* is, I have no doubt, merely the result of the crossing of *G. bankiva* with the common fowl. All the natives from whom I inquired agreed that there is but one species of Jungle-fowl on the islands; and I have myself had abundant evidence of the freedom with which it interbreeds with the domestic bird. There thus remain 16 species of presumed authenticity in Mr. Sharpe's list; and to these I have been able to add 49 others, bringing the full total up to 65 species. I do not pretend that this is by any means an exhaustive list, even of Sulu Island alone, still less of the other islands of the Archipelago, but, as will be seen, it is more than sufficient to show the main source from which the bird-life of that group is derived.

If from the 65 species above mentioned we deduct those birds, for the most part of wide distribution, which are common alike to Borneo and the Philippines, we have 39 species left. Of these, two are new species described in the following pages, and three (*Dicrurus pectoralis*[1], *Ptilopus formosus,* and *Artamides pollens*) are from the Celebes group and the Ké Islands respectively. One, *Carpophaga pickeringi,* though obtained by Cassin from Mangsi, is new to Sulu. Of the rest, three are presumably Bornean, as against no less than 30 Philippine species unrecorded from the former country.

The three Bornean birds—*Scops rufescens, Iyngipicus ramsayi,* and *Gerygone flaveola*—demand a moment's consideration. The Sulu habitat of the first-named species rests on a single individual which was believed to have been shot on Sulu Island by Mr. Burbidge. Mr. Sharpe informs me that the bird reached him unlabelled, and together with other birds shot by Mr. Burbidge in North

[1] *Dicrurus pectoralis* has hitherto only been recorded by Wallace from the Sulla Islands, and by Bruijn from the Obi group.



Outline Map of the Sulu Archipelago.

Borneo. The only examples of *Iyngipicus ramsayi* that I am aware of are in Capt. Wardlaw Ramsay's collection, and are believed to come from N.E. Borneo. In both these cases I would submit that the locality is not a matter of absolute certainty. With regard to *Gerygone flaveola* it is worthy of remark that the Sulu examples of this species appear to be almost intermediate between Bornean birds and *G. simplex* of the Philippines. We have thus three species of doubtful Bornean origin, and no less than ten times that number of Philippine birds. Of the latter, the following is a list; those marked with an asterisk being represented in Borneo by closely allied species.

Table showing the Philippine Species occurring in the Sulu group but wanting in Borneo.

Cacatua hæmaturopygia.	Dicæum hypoleucum.
Prioniturus discurus.	*Cinnyris jugularis.
Tanygnathus luzoniensis.	Cinnyris juliæ.
Tanygnathus burbidgei.	Corone philippina.
Loriculus bonapartei.	*Calornis panayensis.
*Pelargopsis gigantea.	Sarcops calvus.
*Centrococcyx viridis.	*Munia jagori.
*Rhipidura nigritorquis.	Osmotreron axillaris.
*Cyornis philippensis.	Ptilopus melanocephalus.
Oriolus frontalis.	Phabotreron brevirostris.
*Pycnonotus goiavier.	Ianthœnas griseigularis.
*Copsychus mindanensis.	Macropygia tenuirostris.
Cisticola exilis.	Turtur dussumieri.
Parus elegans.	Gallus bankiva.
Zosterops everetti.	Rallina euryzonoides.

Such an immense proportion of Philippine forms is, however, only what would be expected after consulting the charts of the Archipelago. The Strait of Basilan shows soundings of from 30–40 fathoms only, and from that island south-westwards to Tawi-tawi the depths are such that a ship could easily anchor at almost any point on the submarine bank connecting the group. West of Tawi-tawi, however, the level of the sea-bottom completely changes, depths of 100 fathoms or more being obtained close in-shore, while in the fairway of the Strait (the Sibutu Passage) Captain Chimmo was unable to get bottom at 500 fathoms. The distance across the Strait is about eighteen miles, and the surveys hitherto made seem to show an equally precipitous slope of the eastern banks of Sibutu Island. We are at present without exact information as to the soundings between Sibutu and Borneo, one point of which, Tanjong Labian, is distant only twenty miles, but as many islets, reefs, and sand-cays are known to intervene, it is almost certain that they are not of any great depth.

This Sibutu Passage thus seems to be the natural delimitation of the Philippine Archipelago, and though of the only two species obtained, or said to have been obtained, from Sibutu Island, *Oriolus chinensis* and *Sarcops calvus*, the latter at least is purely Philippine, I cannot help thinking that a more extended knowledge of its avifauna would probably show a preponderance of western rather than eastern species.

In the following list I have given in full the Philippine localities, and also the occurrence in Borneo and Celebes, of each species, together with such notes on the habits of the birds as my limited residence on the islands permitted me to make. Where the extreme-length measurements of the different species are given, they are in all cases taken from the birds while in the flesh. The wing-measurements only are from the dry skin.

1. Cacatua hæmaturopygia (Müller).

Psittacus hæmaturopygius, L. S. Müller, S. N. Suppl. p. 77, no. 51.

Cacatua hæmaturopygia, Wald. Tr. Z. S. ix. p. 132; Sharpe, Tr. Linn. Soc. n. s. i. p. 312; id. P. Z. S. 1879, p. 313.

Hab. Luzon, Guimaras, Negros (*Meyer*); Palawan (*Steere*); Zebu, Leyte, Nipa, Panaon, Mindanao (*Everett*); Sulu Island (*Burbidge, Guillemard*); Lapac Island, Sulu Archipelago (*Guillemard*).

a. ♂. Lapac Island.
b–g. ♂. Sulu Island.
h–k. ♀. Sulu Island.
l–n. Sulu Island.

None of the above birds appear to be immature, at least so far as regards plumage, neither does there seem to be any sexual difference. The feathers of the crest are all strongly tinged with lemon-yellow at the base, but the reddish-orange colour which, on the under tail-coverts, gives its specific name to the bird, is on the crest invariably confined to one solitary feather. In some skins the ear-coverts are strongly washed with orange-yellow. Length 32·5–33·0 centims.; wing 21·2–21·8; no difference between ♂ and ♀. Iris pinkish red; brown in the young bird. Bill bluish. Tarsus blue-grey.

This bird is exceedingly common on the island of Sulu, where it seems generally to occur in small flocks of three or four individuals. It is often to be seen in a state of captivity among the natives, and one individual was brought alive to Europe in the yacht 'Marchesa,' and presented to the Zoological Society by Mr. Kettlewell in 1884 [1]. The flesh of this species is good eating, and free from the bitterness so characteristic of many of the Parrots.

2. Prioniturus discurus (Vieillot).

Psittacus discurus, Vieillot, Gal. des Ois. i. p. 7, pl. 26.

Prioniturus discurus, Wald. Tr. Z. S. ix. p. 132; Sharpe, Tr. Linn. Soc. n. s. i. p. 312; id. P. Z. S. 1879, p. 133; Tweedd. // 31
P. Z. S. 1877; 1878, p. 379.

Hab. Luzon (*Meyer, Everett*); Negros (*Steere*); Zebu (*Everett*); Panaon (*Everett*); Mindanao (*Cuming, Everett, Murray*); Basilan (*Steere*); Sulu (*Burbidge*); Balabac (*Steere*); Guimaras (*Meyer*).

It is probable that this species is not common in Sulu Island, for during a residence there of more than six weeks I never obtained a single specimen, and only once saw it.

[1] *Cf.* Sclater, P. Z. S. 1884, p. 251.

3. Tanygnathus luzoniensis (L.).

Psittacus lucionensis, Brisson, Orn. p. 295, no. 41; Linn. S. N. i. p. 146, no. 31.

Tanygnathus luzoniensis, Sharpe, Tr. Linn. Soc. 2nd series, 1876, Zoology, vol. i. p. 312; Wald. Tr. Z. S. vol. ix. pt. ii. p. 133.

Hab. Luzon (*Meyer*); Guimaras (*Meyer*); Negros (*Layard, Steere, Everett*); Zebu (*Everett*); Leyte (*Everett*); Mindanao (*Steere, Everett*); Malanipa (*Murray*); Sulu (*Burbidge, Guillemard*); Palawan (*Steere, Everett*); Basilan (*Steere*).

a, b. ♂. Sulu Island.
c. ♂. Lapac Island.
d, e. ♀. Sulu Island.
f. ♀. Lapac Island.

The large size of the beak at once distinguishes the male bird, in which also the blue of the nape is more pronounced. In none of the individuals is there any blue on the forehead, cheeks, or uropygium. Iris yellowish red in male, "pearly" in female; bill scarlet; tarsus olive. Length 34·0–35·3 centims.; wing 19·0 (♀)–20·7 (♂).

These skins agree with those from the Philippines in the British Museum collection.

4. Tanygnathus burbidgei, Sharpe.

Tanygnathus burbidgei, Sharpe, P. Z. S. 1879, p. 313.

Hab. Sulu (*Burbidge, Guillemard*).

a, b. ♂. Sulu Island.
c, d. ♀. Sulu Island.
e. juv. ♂. Sulu Island. Length 39·5 centims.
f. juv. ♀. Sulu Island. Length 39·0 centims.

First described by Mr. Sharpe from specimens brought from Sulu Island by Mr. Burbidge. The series under consideration bears out the validity of the species, the adult birds having the head a bright yellowish green, the wing-coverts without blue, and a back a dark green, thus differing from *T. everetti* of Mindanao. In the immature male the head is somewhat darker, but, as far as regards plumage there is otherwise no difference from the mature bird. The sexes appear alike. Length 40·0–41·5 centims.; wing 21·8–22·7. Iris red; bill vermilion, dirty white in the young bird; tarsus dull olive-brown.

In common with the preceding species, this *Tanygnathus* is tolerably abundant all over the island of Sulu.

5. Loriculus bonapartei, Souancé.

Loriculus bonapartei, Souancé, Rev. et Mag. de Zool. 1856, p. 222.

Loriculus hartlaubi, Tweed. P. Z. S. 1877, p. 819.

Hab. Leyte, Bohol, Dinagat, Mindanao, and Basilan (*Everett*); Sulu (*Guillemard*).

a–e. ♂. Sulu Island.

Iris brown; tarsus brownish yellow. Length 16·5–16·6 centims.; wing 9·4–9·6 centims.

The five individuals of this species, all of which are males, are almost identical both in colouring and measurement. The forehead is bright orange-red, shading off into a rich orange on the nape. Back and scapulars green, more or less washed with golden yellow; rump and upper tail-coverts light crimson, almost scarlet in some lights, and with a silky gloss. The rest of the body-surface is green, with the exception of a pectoral patch of the same colour as the rump, which commences just below the chin. None show any trace of blue on the head.

This series, then, does not seem to differ appreciably from *L. hartlaubi*, described by Lord Tweeddale, P. Z. S. 1877, p. 819; and a comparison with the skins in the collection of the British Museum shows merely a slightly more scarlet shade in the red of the Sulu examples. But *L. bonapartei* of Souancé also appears identical in every way, and I have therefore adopted his title. In his description the beak is said to be black. It is worthy of note that in the five Sulu examples under consideration the colour of the beak is different in nearly every case. In two birds it is noted as "red," while in the remaining three it is "brown black," "brownish," and "very dark yellow." Yet no one bird appears more adult than another. It is curious that in all the Sulu birds the beaks in the dried skin are black.

6. HALIASTUR INTERMEDIUS, Gurney.

Haliastur intermedius, Gurney, Ibis, 1865, p. 28; *idem*, 1866, p. 247.

Hab. Luzon (*Meyer*); Guimaras (*Meyer*); Zebu, Leyte, Bohol, Negros, and Mindanao (*Everett*); Malanipa (*H.M.S. 'Challenger'*); Sulu (*Guillemard*); Celebes, Borneo (*Mottley*).

a. ♂. Sulu Island.

An old male, the black shafts of the white feathers on the head much prolonged beyond the web of the feather. Iris light pearly yellow; beak pea-green, bluish at base; tarsus pale yellow; claws black. Length 45·0 centims.; wing 38·3. Common on Sulu Island.

7. ELANUS HYPOLEUCUS, Gould.

Elanus hypoleucus, Gould, P. Z. S. 1859, p. 127; Walden, Tr. L. S. viii. p. 36; *id. ibid.* ix. p. 142; Tweed. P. Z. S. 1877, p. 757; Sharpe, P. Z. S. 1879, p. 314.

Hab. Luzon (*Jagor*); Zebu (*Everett*); Mindanao and Basilan (*Everett*); Sulu (*Burbidge*); N.W. Borneo (*Treacher*); Celebes (*Forsten*).

8. BUTASTUR INDICUS (Gmelin).

Falco indicus, Gm. S. N. i. p. 264.

Butastur indicus, Walden, Tr. Z. S. vol. ix. part ii. p. 143.

Hab. Luzon and Guimaras (*Meyer*); Panay and Mindanao

(*Steere*); Zebu, Bohol, and Palawan (*Everett*); Sulu (*Guillemard*); Borneo (*Mus. Lugd.*); Celebes (*Wallace*).

a. ♀. Sulu Island.

Bill yellow, dark at the tip; tarsus yellow. Length 43 centims.; wing 32·5 centims. Shot December 25th.

9. CIRCUS MELANOLEUCUS, Forster.

Circus melanoleucus, Wald. Tr. Z. S. vol. ix. part ii. p. 143.

Hab. "Philippines," Luzon (*Gurney*); Sulu (*Guillemard*).

a. juv. ♂. Sulu Island.

Iris and tarsus bright yellow, beak dark brown. Length 43·6 centims.; wing 34 centims. Shot December 24th. A Harrier, most probably of this species, appeared to be not uncommon on Sulu Island. In the identification of the present example I have had the kind assistance of Mr. J. H. Gurney.

10. SCOPS RUFESCENS, Horsfield.

Scops rufescens, Sharpe, Cat. B. iii. p. 102; *id.* P. Z. S. 1879, p. 314.

Hab. Sulu (*Burbidge*); Borneo (*Low, Diard*).

Mr. Sharpe, *loc. cit.*, says:—"This bird seems to me to differ slightly from Bornean and Malaccan examples in having a much darker face, the ear-coverts shaded with black. I do not, however, propose to found a new species on a single example, and must wait for more specimens. The measurements of the Sulu bird are as follows:—Total length 7 inches, culmen 0·7, wing 4·8, tail 2·6, tarsus 0·85. It will be seen that they are a good deal inferior to those of the type of *Scops mantis* as given by me in the Catalogue."

It should be noted that the Sulu habitat of this species cannot be regarded as an absolute certainty. Mr. Sharpe informs me that this specimen was not labelled, and that it reached him together with Mr. Burbidge's North-Bornean birds. There is therefore a possibility of the skins having become mixed.

11. IYNGIPICUS RAMSAYI, Hargitt. (Plate XVII.)

Iyngipicus ramsayi, Hargitt, Ibis, 1881, p. 598; *id. ibid.* 1882, p. 49.

Hab. Sulu (*Guillemard*); N.E. Borneo?

a, b. ♂. Sulu Island.

c–e. ♀. Sulu Island.

Iris indian-red in the male, less bright and sometimes brown in the female; bill bluish brown; feet dark bluish-black. Length 15·4–15·8 centims.; wing 8·5–8·9 centims.

Mr. Hargitt, to whom I submitted the present series for examination, identifies them with *I. ramsayi*, the types of which, now in Capt. Wardlaw Ramsay's collection, are, I believe, the only examples known. They were said to have been obtained in N.E. Borneo; but the authenticity of the locality does not seem to be absolutely beyond doubt. I did not meet the species during my stay in the North Borneo Co.'s territory, although I obtained *I. auritus*; and in the absence of any definite information, it is quite possible that Capt. Wardlaw Ramsay's birds may have come from Sulu.

The broad white postocular stripe, whitish rump, and unbarred back and tail, together with the yellow throat and broad scarlet occipital band, render the diagnosis of this species easy.

12. EURYSTOMUS ORIENTALIS (L.).

Coracias orientalis, Linn. S. N. i. p. 159, no. 4.

Eurystomus orientalis, Wald. Tr. Z. S. vol. ix. part ii. p. 152; Sharpe, Tr. Linn. Soc. 2nd series, Zool. vol. i.

Hab. Luzon, Cujo Island, and Guimaras (*Meyer*); Zebu, Panaon, Leyte, Dinagat, Basilan, and Palawan (*Everett*); Negros (*Layard, Steere*); Mindanao (*Steere*); Sulu (*Guillemard*); Celebes (*Forsten*); Borneo (*Wallace*).

a. ♂. Sulu.

b–d. ♀. Sulu.

No sexual differences in plumage. These birds correspond with others from more western localities, and exhibit none of the paleness of colouring of the so-called *E. pacificus*. Iris bright brown; bill and tarsus scarlet. Length 27·5–28 centims.; wing 17·7–18·7 centims.

This species did not appear common in the Sulu Archipelago. They are active in their movements, taking short, restless flights, and are consequently somewhat difficult to obtain. In the middle of the month of May, I watched a pair constantly passing in and out of a hole in a lofty tree, in which they appeared to have young ones.

13. ALCEDO BENGALENSIS, Gm.

Alcedo bengalensis, Gm. S. N. i. p. 450, no. 20; Sharpe, Monogr. Alcedinidæ, pl. 2; Walden, Tr. Z. S. vol. ix. part ii. p. 152.

Hab. Luzon (*Meyer*); Negros (*Steere*); Zebu, Leyte, and Bohol (*Everett*); Mindanao (*Steere*); Sulu (*Guillemard*); Borneo (*Beccari, Mottley*).

a. ♀. Maimbun, Sulu Island.

Iris brown; upper mandible black, lower red; tarsus bright coral red. Length 16·7 centims.; wing 7·2 centims.

This bird does not seem to have as yet been recorded from Celebes, though I have myself obtained it on that island. Mr. Wallace has found it as far eastward as Gilolo.

14. ALCEDO ASIATICA, Swains.

Alcedo meningting, Horsf. Tr. L. Soc. xiii. p. 172.

Alcedo asiatica, Swains. Zool. Ill. 1st ser. i. pl. 50; Sharpe, Monogr. Alcedinidæ, p. 23, pl. 7.

Hab. Sulu (*Guillemard*); Borneo (*S. Müller*); Celebes (*Wallace*).

a. ♀. Maimbun, Sulu Island.

Iris light brown; bill coral red, except the ridge of the culmen, which is black; tarsus bright coral. Length 16·4 centims.; wing 6·6 centims. Cheeks strongly marked with blue.

This species has apparently not been recorded from the Philippines. To the south, its eastern limit appears to be Celebes.

15. Pelargopsis gigantea, Walden.

Pelargopsis gigantea, Wald. Ann. & Mag. Nat. Hist. ser. 4, vol. xiii. Feb. 1874; *id.* P.Z.S. 1877, p. 541; *id. ident.* p. 822; *id. ident.* 1878, p. 108; *id. ident.* pp. 341, 943; *id. ident.* 1879, p. 69.

Hab. Panay, Leyte, Dinagat, Mindanao, Basilan (*Everett*); Lapac (*Guillemard*); Salok Island "near Borneo" (*Meyer*).

a, b. ♂. Lapac Island.

Iris dull red; bill and tarsus scarlet. Length 39 centims.; wing 15·5 centims.; bill from gape 9·8 and 10·8 centims.; from forehead 7·9–8·8 centims.

These examples differ from Lord Walden's type in having shorter wings and larger bills; but a larger series will probably show that the present species is hardly separable from the Bornean bird. I am unable to localize Salok, whence the type came. It is apparently not marked either on the Spanish or English charts of the archipelago, neither is there any reference to it in Findlay's 'Directory.' It is to be regretted that more care is not taken in the definition of localities.

16. Sauropatis chloris (Bodd.).

Halcyon chloris (Bodd.), Sharpe, Monogr. Alced. pl. 89; Wald. & Lay. Ibis, 1872, p. 101.

Sauropatis chloris, Wald. Tr. Z. S. vol. ix. part ii. p. 155; Salvad. Orn. Papuas. e Molucche, vol. i. p. 470.

Hab. Luzon, Zebu, Guimaras (*Meyer*); Camiquin and Panay (*H.M.S. 'Challenger'*); Leyte, Bohol, Dinagat, Mindanao, and Basilan (*Everett*); Negros (*L. C. Layard*); Sulu (*Guillemard*); Cagayan Sulu (*Guillemard*); Celebes (*Fraser*); Borneo (*Doria & Beccari*).

a–c. ♂. Sulu Island.

d–f. ♀. Sulu Island.

g. Sulu Island.

Iris brown; bill black, proximal end of lower mandible white or pale bluish; tarsus olive-brown. Length 24–25 centims.; wing 10–11·2 centims.

This widely distributed species is very abundant on the coast, but is rarely seen inland.

17. Macropteryx comatus (Temm.).

Cypselus comatus, Temm. Pl. Color. pl. 268.

Dendrochelidon comata, Salvad. Ucc. di Borneo, p. 123.

Macropteryx comatus, Sw. Class. B. ii. p. 340; Wald. Tr. Z. S. vol. ix. part ii. p. 158.

Hab. Luzon (*Meyer*); Zebu, Mindanao (*Everett*); Negros (*Steere*); Sulu (*Guillemard*); Borneo (*Doria, Beccari, Mottley*).

a, b. ♂. Sulu Island. April and May.

Iris brown; bill and tarsus black. Length 15·2–15·4 centims.; wing 12·9 centims.; thus approximating in measurement to Bornean examples.

The Philippine group appears to be the extreme eastern limit of this species.

18. CENTROCOCCYX VIRIDIS (Scop.).

Cuculus viridis, Scop. Del. Fl. Faun. Insubr. ii. p. 89, no. 47; Wald. Tr. Z. S. viii. p. 58.

Centrococcyx viridis, Wald. Tr. Z. S. vol. ix. part ii. p. 163.

Hab. Luzon, Negros, Guimaras, Panay, Leyte, Bohol, Mindanao, and Zebu (*Meyer*); Sulu (*Guillemard*).

a, ♀. Siassi Island.

Iris brownish red; bill dark slate; tarsus black. Length 39·4 centims.; wing 16·3 centims.

This bird is abundant in the open grassy lands throughout the island of Sulu, together with another species of Cuckoo which I was unable to obtain. When flushed it occasionally perches on low bushes.

19. LANIUS CEPHALOMELAS, Bp.

Lanius cephalomelas, Bp. Rev. et Mag. Zool. 1853, p. 436; Cat. Birds, vol. viii. p. 429.

Lanius nasutus, Wald. Tr. Z. S. ix. part ii. p. 162.

Hab. Leyte (*Everett*); Zebu (*Meyer*); Panay (*Sonnerat*); Sulu (*Guillemard*); N. Borneo (*Mus. Brit.*).

a–c. ♂. Sulu Island.

d. ♀. Sulu Island.

Iris brown; bill and tarsus brownish black. Length 23·5–24·1 centims.; wing 9·2–9·4 centims.

This species seems to be the representative of *L. bentet* in N.E. Borneo, Sulu, and the Philippines. It is characterized by the sharp line of demarcation between the black of the head and the grey of the scapular region. Above, the upper tail-coverts only are ferruginous. Scapulars dull grey, shading into white below. Under surface creamy white; abdomen and flanks ferruginous. Feathers of tail tipped with white, which becomes more or less eroded with age, the base dirty white or fawn colour, excepting in the two middle pairs, which are of a uniform brownish black.

This Shrike was common on Sulu Island, specially affecting small bare isolated trees in the open grassy country.

20. ARTAMUS LEUCORHYNCHUS (Horsf.).

Leptopteryx leucorhynchos, Horsf. Tr. Linn. Soc. xiii. p. 144 (1821); Wald. P. Z. S. 1866, p. 556.

Artamus leucorhynchus, G. R. Gr. Gen. B. ii. p. 285; Cass. Un. S. Expl. Exp. p. 440; Salvad. Ucc. di Borneo p. 140.

Hab. Luzon (*Finsch, Meyer*); Guimaras (*Meyer*); Negros (*Meyer, Everett*); Bohol, Zebu, Basilan, and Leyte (*Everett*); Mindanao (*Steere, Everett*); Sulu (*Burbidge, Guillemard*); Borneo (*Beccari*); Celebes (*Wallace*).

a–c. ♂. Sulu Island.
d–f. ♀. Sulu Island.

Bill leaden blue, almost lavender; iris brown; tarsus black. Length 19·0 centims.; wing 13·4–13·8 centims. Sexes alike in plumage.

This is one of the commonest birds in the Sulu Islands. It is to be seen throughout the day hawking for insects; its square tail and sharp-pointed, though short wings rendering it a noticeable object seen even at a great distance. Now and again it rests upon a dead bough, two or three individuals sitting huddled up close together. It keeps up an incessant twittering cry, and while in the air often wheels about for a considerable time without any movement of the wings. It is one of the last of the diurnal birds to betake itself to roost, and can still be seen hawking when the darkness has fairly set in.

21. Artamides pollens (Salvadori).

Graucalus pollens, Salvad. Ann. Mus. Civic. Genov. vi. p. 75; *id.* P. Z. S. 1878, p. 87.

Artamides pollens, Sharpe, Cat. B. vol. iv. p. 13.

Hab. Ké Bandan, Moluccas (*Beccari*); Lapac Island, Sulu Archipelago (*Guillemard*).

a. Lapac Island.

Iris slate-coloured; bill and feet black. Length about 32·1 centims.; wing 18·0 centims.; tail 16·0 centims.; bill from gape 3·9 centims.; tarsus 2·5 centims.

This example, when compared with one in the British Museum, is somewhat darker on the cheeks, ear-coverts, and lores, and apparently smaller in all its measurements. The differences, however, are hardly sufficient to lead me to separate it specifically from *A. pollens* from the Ké group, especially as I have but one individual. That this species should be found at such a great distance from the locality whence it was first recorded is very curious. A large series of any species of *Graucalus* is, however, seldom seen in collections; they are somewhat rare birds and generally very shy, and it is not improbable that we may, before long, obtain this species from some of the intermediate localities.

22. Lalage dominica (Müll.).

Turdus dominicus, L. S. Müller, Suppl. p. 145, no. 56, ex Pl. Enl. 273, f. 2.

Lalage dominica, Wald. Tr. Z. S. vol. ix. part ii. p. 178; Sharpe, Tr. Linn. Soc. 2nd ser. Zool. vol. i. p. 324.

Lalage terat, Cat. B. iv. p. 95.

Hab. Zebu, Guimaras (*Meyer*); Panay, Mindanao (*Steere*); Basilan, Negros, Leyte, Bohol, and Luzon (*Everett*); Sulu (*Guillemard*); Borneo (*S. Müller*).

a, b. ♂. Sulu Island.
c. juv. ♀. Sulu Island.

The immature bird has the head and scapulars grey, the former streaked with black; beneath, the breast and flanks are lightly barred with grey.

Iris brown; bill and tarsus black. Length 17·5–19·0 centims.; wing 9·2–9·4 centims. These skins agree with those of Bornean origin. The representative *L. leucopygialis* of Celebes differs only in having the back and rump pure white. This species appears to frequent the jungle only.

23. Pericrocotus marchesæ, sp. nov. (Plate XVIII. fig. 1.)

♂. *Superne nitide niger; dorso inferiore, uropygio et supracaudalibus læte aurantiaco-flavis: alis nigris, tectricum majorum apicibus, et secundariis basin versus, flavis, speculum alare magnum formantibus; primariis intimis versus basin, et secundariis intimis versus apicem, pogonio exteriori flavo ornatis; subalaribus flavis; cauda nigra, rectricibus centralibus omnino nigris, reliquis ad basin nigris, sed flavo gradatim terminatis; pileo, capitis lateribus, mento gulaque nigris; corpore reliquo subtus læte aurantiaco-flavo; iride brunnea; rostro et pedibus nigris.*

Long. tot. 0·168^{m}–0·173^{m}; *al.* 0·076^{m}–0·078^{m}; *caud.* 0·086^{m}; *rostr.* 0·013^{m}; *tars.* 0·014^{m}.

Hab. Insula "Sulu" dicta.

a, b. ♂. Maimbun, Sulu Island, May 15th, 1883.

But two examples of this beautiful new species were obtained, and no others were observed during the 'Marchesa's' visit to the Archipelago. They were shot at the edge of some thick jungle in the south of the island of Sulu.

24. Chibia pectoralis (Wallace).

Dicrurus pectoralis, Wall. P. Z. S. 1862, pp. 335, 342; Finsch, Neu-Guinea, p. 170.

Chibia borneensis, Sharpe, P. Z. S. 1879, p. 246.

Chibia pectoralis, Sharpe, Cat. B. iii. p. 240.

Hab. Sulla Islands (*Wallace*); Obi group (*Bruijn*); Sulu (*Guillemard*).

a–c. ♂. Maimbun, Sulu Island.

d, e. ♀. Maimbun and Parang, Sulu Island.

f. (In moult), Sulu Island.

Iris crimson lake; in *a*, an apparently old male, it is reddish brown. Bill and tarsus black. Length *circa* 28·0 centims.; wing 14·8–15·6 centims.

These individuals differ a good deal in the size, colouring, and distribution of the metallic spots on the head and throat, and these characteristics can therefore be no guide whatever to the identification of the species. The frontal tuft of silky plumes appears only to be acquired by old adults. Three of the present series, two of them being females and the third of undetermined sex, are entirely destitute of it. I have examined the type of Mr. Sharpe's *C. borneensis*, described in P. Z. S. 1879, and do not regard it as specifically separable from the present bird. The frontal plumes are much developed, but not more so than might be the case in an old male of *C. pectoralis*. I understand that no label was affixed to the bird when received, and that some Sulu birds were forwarded to the Museum at the same time. It is therefore not unlikely that this bird is from that locality.

25. Rhipidura nigritorquis, Vigors.

Rhipidura nigritorquis, Vig. P. Z. S. 1831, p. 97; Sharpe, Tr. Linn. Soc. 2nd ser. Zool. vol. i. p. 325.

Leucocerca nigritorquis, Wald. Tr. Z. S. vol. ix. pt. ii. p. 182.

Hab. Luzon, Zebu (*Meyer*); Basilan (*Everett*); Palawan, Mindanao (*Steere*); Dinagat, Negros, Bohol (*Cat. B.* vol. iv.); Sulu (*Guillemard*); Siassi (*Guillemard*).

a, b. ♂. Sulu Island.

c. Sulu Island.

d. Siassi Island.

Iris brown; bill and tarsus brownish black. Length *circa* 19·5 centims.; wing 8·2–8·4 centims. Sexes alike in plumage.

Abundantly distributed throughout the island of Sulu, being found in the small isolated bits of jungle which are so common in the island. It is in constant motion, and is fond of displaying the tail-feathers in the characteristic manner of the genus, usually confining itself to low bushes and trees at no great distance from the ground.

26. Cyornis philippensis, Sharpe.

Cyornis banyumas (Horsf.), Walden, Tr. Z. S. vol. ix. part. ii. p. 182.

Cyornis philippensis, Sharpe, Tr. Linn. Soc. 2nd ser. Zool. vol. i. p. 325; Cat. B. vol. iv. p. 450.

Hab. Panay (*Steere*); Zebu (*Meyer*); Luzon (*Jagor*); Sulu (*Guillemard*).

a. ♀. Sulu Island.

Iris brown; bill black; tarsus greyish. Length 14·9 centims.; wing 7·2 centims. Lores buffish white.

This bird has the white abdomen and under tail-coverts noticed by Mr. Sharpe in the Philippine birds of Dr. Steere's collection. It is noticeable that a *Cyornis* with these characteristics has been described by Jerdon (Birds of India, i. p. 466). The true *C. banyumas* of Horsf. inhabits Palawan, Celebes, and Borneo.

The present specimen was the only one met with during my residence in the Archipelago.

27. Hypothymis occipitalis, Vigors.

Hypothymis occipitalis, Vig. P. Z. S. 1831, p. 97; Sharpe, Cat. B. vol. iv. p. 275.

Hab. Basilan (*Steere*); Sulu (*Guillemard*); Borneo (*Everett*).

a. ♀. Sulu Island.

b, c. juv. ♀. Sulu Island.

Iris brown; bill bluish black; tarsus black. Length about 15·0 centims.; wing 6·6 centims.

a is a female in nearly perfect plumage, but both the nape-spot and pectoral band are imperfect. In *b* there is no sign of either; the head, throat, and breast are dull blue; the upper surface is pale grey, washed with blue. In *c*, a still younger example, the head alone is dull blue, the rest of the upper surface brown.

If this species and *H. azurea* of Capt. Wardlaw Ramsay (Orn. Works Tweedd. Append. p. 656) are identical, as is probable, its habitat should be further extended to Luzon, Zebu, Negros, Guimaras, Mindanao, and Palawan.

28. Hirundo javanica, Sparrm.

Hirundo javanica, Sparrm. Mus. Carls. t. 100; Salvad. Ornit. Papuas. e Molucche, vol. 2, p. 3; *id.* Ucc. di Born. p. 126.

Hab. Zebu, Leyte, Bohol, Dinagat, Palawan (*Everett*); Borneo (*Mottley, Beccari*); Celebes (*Wallace*); Sulu (*Guillemard*).

a, ♂. Sulu Island.
b, ♀. Sulu Island.

Iris brown; bill and feet black. Length *circa* 12·0 centims.; wing 10·5 centims. This species was common in Sulu at the end of April, frequenting the sea-shore, and perching on the native fishing-stakes, or on bare stumps of trees protruding from the water.

29. Oriolus chinensis, Linn.

Oriolus chinensis, Linn. S. N. i. p. 160; Sharpe, Tr. Linn. Soc. 2nd ser. Zool. vol. i. p. 328; *id.* P. Z. S. 1879, p. 315.
Broderipus acrorhynchus, Wald. Tr. Z. S. ix. pt. ii. p. 185.
Oriolus suluensis, Sharpe, Cat. B. vol. iii. p. 205.
Oriolus frontalis, Wall. P. Z. S. 1862, p. 340, pl. xl.
Broderipus palawanensis, Tweedd. P. Z. S. 1878, p. 616.

Hab. Luzon and Guimaras (*Meyer*); Panay (*Murray*); Negros (*Meyer, Steere, Everett*); Zebu (*Meyer, Murray, Everett*); Basilan, Leyte, Panaon, Bohol, and Dinagat (*Everett*); Mindanao (*Steere, Murray, Everett*); Sulu (*Burbidge, Guillemard*); Lapac (*Guillemard*); Sibutu (*Low*); Balabac (*Steere*); Palawan (*Lemprière*).

a–c, ♂. Sulu Island.
d, ♂. Lapac Island.
e, f, ♀. Sulu Island.
g, juv. ♂. Sulu Island.

Iris dull red; brown in the female; bill pink; legs greyish. Length 29·0–32·5 centims.; wing 15·0–16·3 centims. The females are recognizable by their less bright colouring, and by the greenish tint of the back. There is but little difference in the size of the yellow frontal patch, except in the case of the bird from Lapac, in which it is rather small. In two of the adult males the middle pair of rectrices are entirely black; in the other two they are strongly tipped with yellow. The yellow apices of the secondaries appears an equally variable characteristic, occurring in some individuals but not in others.

The immature male, *g*, is of a uniform dull yellow, the back washed with greenish as in the female, rump bright yellow. The large ill-defined yellow frontal patch shades off posteriorly into a greenish black occipital and nuchal patch; lores greenish yellow; wing-feathers brown, some of the secondaries washed on the outer web with greenish yellow; two middle rectrices yellowish brown; breast with a few black stripes. Bill pinkish yellow, iris dull crimson; length 29·5 centims.; wing 15·5 centims.

A comparison of this series with the Philippine skins of *O. chinensis* in the British Museum, does not show any apparent specific distinction, and Mr. Sharpe has regarded Mr. Low's skins of *O. suluensis* as a subspecies of *O. frontalis* of Wallace. I have skins of an Oriole from Palawan which are not separable from either, and I am therefore led to regard the Philippine, Sulu, and Palawan birds as identical, from which it is difficult to separate the Sulla Oriole.

30. Pycnonotus goiavier (Scop.).

Petit goiavier de Manille, Sonn. Voy. Nouv. Guin. p. 59, pl. 28.
Ixus goiavier, Walden, Tr. Z. S. vol. ix. part ii. p. 190.

Hab. Luzon (*Meyer*); Leyte, Negros, and Bohol (*Everett*); Mindanao (*Everett*, *Murray*); Basilan (*Everett*); Sulu (*Guillemard*).

a–c, ♂. Sulu Island.
d, ♀. Sulu Island.

Iris brown; bill and claws brownish black. Length *circa* 20·8 centims.; wing 7·4–8·8 centims. Is chiefly found in the thicker jungle, and sings well.

Differs from *P. analis* (Horsf.) of Borneo, in having the auricular region brown (*Salvadori*).

31. Macronus kettlewelli, sp. nov. (Plate XVIII. fig. 2.)

Brunneus; dorsi plumis filiformibus, elongatis, versus basin nigricantibus; rachide, et partibus plumæ rachidi adjacentibus, albidis; alis fulvescenti-brunneis, exterius pallidioribus; supracaudalibus caudaque pallide castaneis; pileo dorso concolori, rachidibus plumarum albidis; fronte nigricante, magis distincte striata; superciliis, loris et regione parotica nigricantibus, albo lineatis; genis et corpore toto subtus pallide cervinis; hypochondriis brunnescentibus; gula summa et abdomine medio albicantibus; gutture et corporis lateribus vix albido lineatis; subalaribus pectori concoloribus; iride smaragdinea; rostro et pedibus brunneis.

Long. tot. circa $0{\cdot}140^{m}$; *al.* $0{\cdot}063^{m}$; *caud.* $0{\cdot}070^{m}$; *rostr.* $0{\cdot}015^{m}$; *tars.* $0{\cdot}024^{m}$.

Hab. Insula "Sulu" dicta.

a, ♂. Lukatlapas, Sulu Island, May 18th, 1883.

The only example obtained. It was shot close to or on the ground, in a patch of jungle near the centre of the island. The iris is a beautiful clear green, in shade not unlike that of the Bornean *Cymbirhynchus*. I have named this interesting new species after Mr. Kettlewell, whose adventurous voyages in the yacht *Marchesa* have done much to help the science of Ornithology.

32. Copsychus mindanensis (Gmelin).

Le Merle de Mindanao, Montb. Hist. Nat. Ois. iii. p. 387.

Copsychus mindanensis, Wald. Tr. Z. S. vol. ix. part 2, p. 194.

Hab. Zebu, Guimaras (*Meyer*); Luzon and Basilan (*Everett*); Negros (*L. C. Layard*); Mindanao (*v. Martens*); Sulu (*Guillemard*); Borneo (?) (*Salvadori*).

a, b. ♂. Sulu Island.

Iris brown; bill and tarsus black. Length 20·5 centims.; wing 9·4–9·7 centims. Under wing-coverts entirely black.

33. Gerygone flaveola, Cabanis.

Gerygone flaveola, Cab. J. f. O. 1873, p. 157; Cat. B. vol. iv. p. 214, pl. v. fig. 2.

Hab. Celebes (*Meyer*); Borneo (*Schwaner, Mus. Lugd.*); Sulu (*Guillemard*).

a, ♂. Sulu Island.

b, ♀. Sulu Island.

c. Sulu Island.

Iris brown; bill and tarsus blackish. Length of wing 5·2 centims.

A comparison with skins of *G. flaveola* from Celebes in the British Museum shows the present individuals to be considerably paler on the under surface, which is a washy straw-yellow in colour. The ear-coverts also are of the same colour as the head, without any shade whatever of yellow. These Sulu birds appear, therefore, to be intermediate in form between *G. flaveola* of Celebes (and Borneo?) and *G. simplex* of Luzon, the latter bird being white beneath, washed with buff on the breast, and having the ear-coverts a uniform ashy brown. The present series approximate *G. simplex* in their admeasurements.

34. Cisticola exilis (Vig. et Horsf.).

Cisticola exilis, Sharpe, Cat. Birds, vol. vii. p. 269.

Cisticola grayi, Tweedd. P. Z. S. 1877, p. 828.

Cisticola semirufa, Wardlaw Ramsay, Orn. Works, Tweedd. p. 657 (1881).

Hab. Luzon; N. Mindanao (*Everett*); Sulu (*Guillemard*).

a–c, ♂. Sulu Island, April.

d, ♀. Sulu Island, April.

Iris brown; bill and tarsus flesh-colour. The head in all is more or less striped. Length about 9·0 centims.; wing 4·4 centims. This species was common in Sulu in the grassy opens, to which it appears entirely confined.

In the correct identification of this as well as of several other species, I have had the kind assistance of Mr. Bowdler Sharpe. As far as I am aware, it has not been recorded either from Borneo or

Celebes; but the immense range of the species renders it probable that it may be found in both these countries.

35. Budytes viridis (Gmelin).

Motacilla viridis (Gm.), v. Martens, J. f. O. 1866, p. 10.

Budytes viridis, Wald. Tr. Z. S. vol. ix. part 2, p. 196.

Hab. Luzon (*v. Martens*); Bohol and Mindanao (*Everett*); Sulu (*Guillemard*); Borneo (*Mottley, Beccari*); Celebes (*Meyer*).

a, ♂. Jolo, Sulu Island.

b, *vix ad.* ♀. Sulu Island.

c, *juv.* ♀. Jolo, Sulu Island.

Iris brown; bill brownish black; tarsus bluish black. Length of adult male and female 17·5 centims.; of immature female 17·0 centims.; wing 8·4 centims.; of immature female 7·5 centims. Shot from April 24th to May 10th, hunting for insects on cultivated ground near the Spanish settlement. The individual *b* is marked with green on the under surface, chiefly on the upper breast, but is otherwise like the male. The young female has the head ash-coloured, and the underparts are a pale yellow.

36. Parus elegans, Lesson.

Parus elegans, Less. Tr. p. 456; Sharpe, Tr. Linn. Soc. vol. i. p. 338.

Machlolophus elegans, Wald. Tr. Z. S. vol. ix. part 2, p. 199.

Hab. Zebu and Negros (*Everett*); Palawan and Guimaras (*Steere*); Sulu (*Guillemard*).

a, ♂. Sulu Island.

b, ♀. Sulu Island.

Iris brown; bill and tarsus black. Length of wing 5·9 centims. In both skins the white spots on the wing are small. An increase in the size of these, and the assumption of the pale scapulars seems to be due to age.

This species appears to be rare in Sulu, for the two individuals under consideration were the only ones seen.

37. Zosterops everetti, Tweeddale.

Zosterops everetti, Tweed. P. Z. S. 1877, pp. 762, 829; *id. ibid.* 1878, pp. 111, 950; Sharpe, Cat. B. vol. ix. p. 163.

Hab. Mindanao, Zebu, and Dinagat (*Everett*); Sulu (*Guillemard*).

a, *b*. ♂. Sulu Island.

c, ♀. Sulu Island.

Iris brown; upper mandible dark brown, lower whitish; tarsus light brown. Length *circa* 11·0 centims., wing 5·3 (♂)–5·0 (♀) centims.

A comparison with the individuals from the Philippines shows the Sulu bird to be of a brighter yellow, and destitute of any subocular dusky mark.

38. Dicæum hypoleucum, Sharpe.

Dicæum hypoleucum, Sharpe, 'Nature,' Aug. 1876, p. 298; *id.* Tr. Linn. Soc. 2nd ser. Zool. vol. i. p. 339; Tweedd. P. Z. S. 1879, p. 72.

Hab. Basilan (*Steere*); Sulu (*Guillemard*); Siassi (*Guillemard*).
a, b. ♂. Sulu Island.
c. juv. ♂. Sulu Island.
d. ♀. Parang, Sulu Island.
e. juv. ♀. Siassi Island.
f. juv. ♀. Sulu Island.

Iris, in the adult, light reddish brown; bill and tarsus black. Length about 9·5 centims., wing 5·4–5·6 centims. The adult birds of both sexes are deep black on the upper surface, with a faint tinge of bluish green, most marked on the wing. The middle line of the breast and abdomen is washed with pale buff. In the young birds the black of the upper surface is replaced by a dull olive-brown, and the outer webs of the secondaries are bordered with olive-green. This edging becomes narrower on the primaries, and is absent altogether from the first two or three.

D. hypoleucum appears to be abundant in the Sulu Archipelago, and is almost always to be found in the cocoanut groves, hunting at the crown of the palms for insects, in company with *Cinnyris jugularis.*

39. Cinnyris jugularis (Linnæus).

Cinnyris jugularis, Sharpe, Tr. Linn. Soc. 2nd ser. Zool. vol. i. p. 341; *id.* Cat. B. vol. ix. p. 86.

Arachnecthra jugularis, Wald. Tr. Z. S. vol. ix. pt. 2, p. 200.

Hab. Negros, Guimaras, Zebu (*Meyer*); Luzon, Leyte, Bohol, Dinagat, and Basilan (*Everett*); Camiquin (*H.M.S. 'Challenger'*); Panay, Mindanao (*Steere*); Sulu (*Guillemard*).
a–m. ♂. Sulu Island.
n, o. ♀. Sulu Island.

Iris brown; bill and tarsus black. Length 11·3–11·7 centims. ♀ about 11·0 centims. Wing 5·4–5·7 centims.; in female about 5·2 centims.

In three or four of the above males there is a patch of metallic blue feathers at the upper and outer angle of the eye, forming a partial eyebrow, and in most skins some faint trace of this is to be seen. In several individuals also there are scattered metallic blue feathers in the frontal region. There is no tendency whatever to this metallic colouring on the head in any of a large series of *C. frenata* that I obtained from Celebes and the islands eastward to New Guinea.

The present species is extremely abundant in Sulu Island. As far as I am aware, it has not been recorded from Palawan, where *C. aurora* probably replaces it.

40. Cinnyris juliæ (Tweeddale).

Nectarophila juliæ, Tweedd. P. Z. S. 1877, pp. 536, 547.

Cinnyris juliæ, Shelley, Monogr. Nect. p. 135, pl. 44; Cat. B. vol. ix. p. 64.

Hab. Malanipa (*H.M.S.* '*Challenger*'); Mindanao (*Everett*); Sulu (*Guillemard*).

a–g. ♂. Maimbun, Sulu Islands.

Iris red-brown; bill and tarsus black. Length 9·9–10·5 centims., wing 4·8–5·0 centims.

This exquisite little Sun-bird seemed nowhere abundant on Sulu Island; but a pair or two were always to be found haunting some low flowering shrubs at the back of the little village of Maimbun. The present individuals agree exactly with the types brought home by the 'Challenger,' at present in the British Museum. It is curious that Dr. Steere did not meet with this species in Mindanao or Basilan, from which latter island it has been recorded, though Mr. Everett obtained it at Zamboanga on the former. The 'Challenger' party found it "quite numerous" in Malanipa.

41. Anthothreptes malaccensis (Scopoli).

Anthreptes malaccensis, Sharpe, Tr. Linn. Soc. 2nd ser. Zool. vol. i. p. 342; Cat. B. vol. ix. p. 122.

Hab. Zebu (*Everett*); Negros (*Steere*); Mindanao (*Everett*); Basilan and Palawan (*Everett*); Sulu (*Guillemard*); Celebes (*Wallace*); Borneo (*Wallace*).

a–j. ♂. Sulu Island.

k–o. ♀. Sulu Island.

Male. Iris brownish red; bill black; tarsus olive-brown. Length about 13·7 centims., wing 6·9–7·1 centims.

Female. Iris brown; bill black; tarsus light olive-brown. Length about 12·0 centims., wing 6·4–6·6 centims.

I have followed Dr. Gadow's arrangement in the 'Catalogue of Birds,' and regarded the Bornean *Anthothreptes* as not specifically separable from that of the Philippines. The differences, though considerable so far as regard colouring, appear to be anything but constant, and the present series vary much both in size and colouring. Many Bornean skins show a like variation. The Sulu birds on the whole do not appear to differ much from the generality of those from Borneo.

This Sun-bird was apparently abundant in all the islands of the Archipelago that we visited, and we also obtained it on the solitary volcanic island, Cagayan Sulu.

42. Corvus philippinus, Bonaparte.

Corvus philippinus, Wald. Tr. Z. S. ix. part 2, p. 201; Tweedd. P. Z. S. 1877, pp. 548, 698, 763, 831; 1878, pp. 113, 287, 343, 381.

Corone philippina, Sharpe, Tr. Linn. Soc. 2nd ser. Zool. vol. i. p. 343.

Hab. Luzon (*Cuming, Meyer, Everett*); Cujo (*Meyer*); Panay (*Murray*); Negros (*Meyer, Steere, Everett*); Bohol, Basilan, Zebu, Leyte, and Panaon (*Everett*); Camiquin (*Murray*); Dinagat (*Everett*); Mindanao (*Murray, Everett*); Sulu (*Burbidge*).

Crows, most probably of this species, were common in Sulu Island.

43. Calornis panayensis (Scopoli).

Calornis panayensis, Wald. Tr. Z. S. ix. part 2, p. 205; Sharpe, Tr. Linn. Soc. n. s. Zool. vol. i. p. 343.

Hab. Panay (*Steere*); Zebu, Luzon, Negros (*Meyer*); Leyte, Bohol, Mindanao, Basilan, and Palawan (*Everett*); Sulu (*Guillemard*); Siassi (*Guillemard*).

a–d. ♂. Sulu Island.
e, f. ♀. Sulu Island.
g. juv. ♀. Sulu Island.
h. Siassi Island.

Iris brilliant orange-scarlet; bill and tarsus black. Length about 20·5 centims., wing 10·2–10·4 centims.

Most abundant on Sulu, and other islands of the Archipelago. In April they were apparently breeding in holes in dead trees some distance from the ground.

44. Sarcops calvus (Linnæus).

Sarcops calvus, Walden, Tr. Z. S. vol. ix. part 2, p. 205; Sharpe, Tr. Linn. Soc. n. s. Zool. vol. i. p. 344.

Sarcops lowii, Sharpe, Tr. Linn. Soc. n. s. Zool. vol. i. p. 344.

Hab. Luzon (*Everett*); Guimaras and Negros (*Meyer*); Zebu, Leyte, Dinagat, Mindanao, and Basilan (*Everett*); Sulu (*Guillemard*); ? Sibutu (*Low*).

a–h. ♂. Sulu Island.
i–k. ♀. Sulu Island.
l, m. Sulu Island.

Iris brown; bill and feet black; bare space round the eye tinged with dull red. In some, the primaries and tail-feathers, and sometimes the thighs, are tinged with ferruginous. This colouring seems generally to coexist with a nigrescent mantle, and is probably a sign of immaturity. Mr. Sharpe agrees with me that *S. lowii* cannot stand as a good species, the present series showing it to be a not fully adult *S. calvus*.

Sibutu Island, whence this species is said to have been procured, lies close to the North Bornean coast, and is separated from Tawitawi, the westernmost island of the Sulu Archipelago, by the Sibutu Passage, in which soundings with no bottom at 500 fathoms have been obtained. *Oriolus chinensis* is also recorded by Mr. Low from the same island, but it is quite possible that the locality of these two species may not have been correctly given by this gentleman's collector.

45. MUNIA JAGORI, Cabanis.

Munia jagori, Wald. Tr. Z. S. vol. ix. pt. 2, p. 207.

Hab. Luzon, Zebu, Leyte, Bohol, Negros, and Mindanao (*Everett*); Sulu (*Guillemard*).

a–d. ♂. Sulu Island.

e–g. ♀. Sulu Island.

Iris reddish brown; bill ashy blue; tarsus slate-coloured. Length 11·0 centims. (♂), 10·5 centims. (♀), wing 5·0 centims. (♂), 4·8 centims. (♀). The male is larger than the female, and of richer colouring, the head being very nearly black, and the brown of the body a deeper chestnut. The union of the abdominal dark line with the same colour of the throat does not appear to be of any value as a characteristic of sex.

This little species was abundant in Sulu, collected in flocks of from ten to thirty individuals, and feeding in the grass. Their habits and note reminded me strongly of the African *Estrelda astrild.*

46. OSMOTRERON VERNANS (Linnæus).

Osmotreron vernans, Wald. Tr. Z. S. vol. ix. pt. 2, p. 210; Sharpe, Tr. Linn. Soc. n. s. Zool. vol. i. p. 346; Salvad. Uccell. di Borneo, p. 286.

Hab. Luzon (*Meyer*); Panay (*Steere*); Zebu, Bohol, Mindanao, Basilan, and Palawan (*Everett*); Sulu (*Burbidge*); Siassi (*Guillemard*); Celebes (*Wallace, &c.*); Borneo (*Wallace, &c.*).

a. ♂. Sulu Island.

b. ♂. Siassi Island.

c–f. ♀. Sulu Island.

Male: iris dark pink; bill slate-blue at tip; feet coral. Female: iris pearly; bill as in male; tarsus pinkish red. Length about 27·0 centims.; wing 14·3–14·5 centims.

47. OSMOTRERON AXILLARIS, G. R. Gray.

Osmotreron axillaris, Wald. Tr. Z. S. vol. ix. pt. 2, p. 211; Sharpe, Tr. Linn. Soc. n. s. Zool. vol. i. p. 346.

Hab. Luzon (*Meyer*); Zebu, Dinagat (*Everett*); Panay (*Murray*); Negros and Guimaras (*Meyer*); Mindanao (*Steere*); Sulu (*Burbidge, &c.*).

a. ♂. Sulu Island.

b. ♀. Sulu Island.

Male: iris pearly green; bill red at base, bluish at tip; feet pale slate; length 32·7 centims., wing 16·5 centims. Female: iris brilliant sea-green; feet light olive-green; length 29·5 centims., wing 16·1 centims. Culmen 2·1–2·2 centims.

O. aromatica from Buru very closely resembles the present species, but Salvadori (Orn. della Papuasia e delle Molucche, vol. 3, p. 2) points out that the latter "are larger, have the neck and breast of a less yellow-olive, the chestnut of the wing-coverts less in extent, and dark spots on the sides of the abdomen." The examples under consideration fully bear this out with regard to the size.

48. PTILOPUS MELANOCEPHALUS, Forster.

Ptilopus melanocephalus, Wald. P. Z. S. 1878, p. 951 ; *id. ident.* 1879, p. 73.

Hab. Mindanao (*Everett*) ; Basilan (*Everett*) ; Sulu (*Guillemard*) ; Celebes (*Guillemard*).

a, b. ♂. Sulu Island.

Iris yellow ; bill greenish ; tarsus coral. Length 22·5 centims., wing 11·8 centims. These Sulu examples do not differ from Celebean skins (*P. melanospilus* of Salvadori), excepting in having the yellow gular patch slightly paler and broader.

49. PTILOPUS FORMOSUS (G. R. Gray).

Lamprotreron formosa, G. R. Gray, P. Z. S. 1860, p. 360 ; Wallace, Ibis, 1865, p. 379 ; Walden, Tr. Z. S. viii. p. 82.

Hab. Celebes (*Wallace*) ; Sulu (*Guillemard*).

a. ♂. Sulu Island.

Iris sea-green ; bill green, reddish at base ; tarsus greenish olive. Length 29·5 centims. ; wing 14·4 centims..

P. formosus of Gray can be at once recognized as distinct from the Moluccan and Papuan *P. superbus*, (1) by the strong violet tinge of the upper breast, which merges into the dark pectoral band, and, (2) by the violet of the head being conterminous with the ruddy orange of the cervix, there being no intervening greenish band. The present Sulu example shows both these distinctions, but appears to be of somewhat larger size, and is characterized by the absence of the *maillée* appearance of the breast, due to the small number of feathers that are bifid. The following are the comparative admeasurements in centimetres :—

	Length.	Wing.
P. formosus, Celebes (*Wallace*)	26·5	12·6
„ „ (*Guillemard*)	25·0	13·2
„ Sulu (*Guillemard*)	29·5	13·4

50. PHABOTRERON BREVIROSTRIS, Tweeddale.

Phabotreron brevirostris, Tweedd. P. Z. S. 1877, pp. 549, 832 ; *id. ident.* 1878, pp. 113, 344, 952 ; *id. ident.* 1879, p. 73.

Hab. Leyte, Dinagat, Mindanao, and Basilan (*Everett*) ; Sulu (*Guillemard*).

a. ♀. Sulu Island.

Iris, outer ring red, inner white ; bill brownish ; tarsus dull coral-red. Length 23·0 centims., wing 11·6 centims., bill from forehead 1·5 centims., tail 9·0 centims.

This example agrees with Lord Tweeddale's description of *P. brevirostris*, excepting that the back and upper tail-coverts are dull metallic olive. In the type (from Mindanao) the back is " mixed amethystine and dull yellow-green ; uropygium and upper tail-coverts dull yellow-green with scarcely any iridescence." The Sulu bird corresponds, however, in having the rufo-fulvous forehead, the albescent chin and throat, and the short bill, the characteristics which led Lord Tweeddale to separate it from the representative *P. leucotis,* which has been recorded from Luzon, Negros, and Guimaras.

51. Carpophaga ænea (Linnæus).

Carpophaga ænea, Wald. Tr. Z. S. vol. ix. pt. 2, p. 215; Sharpe, Tr. Linn. Soc. n. s. Zool. vol. i. p. 346; Salvad. Ucc. di Born. p. 290.

Hab. Luzon (*Meyer*); Zebu, Leyte, Mindanao, Dinagat, and Basilan (*Everett*), Negros and Palawan (*Steere*); Sulu (*Guillemard*); Borneo (*Wallace*).

a. ♂. Sulu Island.

b, c. ♀. Sulu Island,

Iris crimson; bill greyish green; feet dull red. Length 42·0–43·0 centims.; wing 23·7–24·0 centims.

Compared with examples of Wallace's from the Timor group, the Sulu birds are seen to be brighter in the iridescence of the back and wings, the head is more vinaceous, there is a well-marked grey collar, and the under wing-coverts are pale dove-colour, not a darkish grey.

C. ænea seemed abundant enough on Sulu Island, but, like *M. bicolor,* it was difficult to obtain, owing to the great height of the trees which it frequented.

52. Carpophaga pickeringi, Cassin.

Carpophaga pickeringi, Cass. Pr. Philadelph. Acad. 1854, p. 228; *id.* U.S. Expl. Exp. p. 267, pl. xxvii.; Sharpe, Tr. Linn. Soc. n. s. i. p. 353; *id.* P. Z. S. 1879, p. 316.

a. ♀. Sulu Island.

Iris dull red; space round eye red; bill bluish green; feet and tarsus dull purplish red. Length 42·0–44·0 centims.; wing 22·8–25·5 centims.; tarsus 3·2 centims.

Head ash colour, more or less tinged with vinaceous; forehead and chin white; throat and breast pale vinaceous; sides of body, abdomen, and thighs pale ash; under tail-coverts somewhat darker, and more or less washed with dull fawn-colour towards the tips. Mantle pale clear ash; back, outer surface of wings, and uropygium dull dark grey with faint pinkish and green iridescence, hoary in some lights. Tail above dull metallic green; below greyish, schistaceous.

Being unable satisfactorily to determine this species from Cassin's very short description of *C. pickeringi,* I forwarded an example to Mr. Ridgway, who kindly compared it with the type in the Washington Museum. He writes:—"I believe them to be specifically identical. The slight differences which I am able to detect are as follows:—

"In the type of *C. pickeringi* the nape is much less purely grey, and the colour shades more gradually into the brownish slate-colour of the back; the head, neck, and lower parts are also more brownish; but the difference, as well as that of the nape, is certainly due, to a great extent at least, to soiling of the plumage. The wings &c. are a little bit darker and more brownish than in your specimen, and there is a more decided metallic bronzy purplish gloss, somewhat mixed with green, over the wings, but hardly perceptible on the back. The measurements are as follows:—Wing 23·0–25·4 centims.; culmen 2·1 centims.; tarsus 2·9 centims."

Before visiting the Sulu Archipelago I had found this species in abundance on the island of Cagayan Sulu, off the north coast of Borneo, and Cassin's specimens were obtained from a small island near Balabac. Its area of distribution is thus somewhat curious, as it has never been recorded from Borneo.

53. MYRISTICIVORA BICOLOR (Scopoli).

Myristicivora bicolor, Wald. Tr. Z. S. vol. ix. pt. 2, p. 217; Sharpe, Tr. Linn. Soc. n. s. Zool. vol. i. p. 347; Salvad. Orn. della Papuasia, vol. iii. p. 107.

Hab. Negros (*Meyer*); Mindanao (*Everett*); Balabac (*Steere*); Sulu (*Guillemard*); Celebes (*Meyer*); Borneo (*Schwaner*).

a. ♂. Sulu Island.

b. ♀. Sulu Island.

Iris dark brown; bill and feet black. Length of wing 21·6–22·4 centims. These examples have no black upon the tibials or under tail-coverts. In the female the external webs of the first two or three primaries have a white patch at their base, but this is not regular on either side. The same bird has the two internal secondaries wholly white.

This species was extremely abundant in Sulu in the month of May, but it was most difficult to secure specimens, owing to the bird's habit of invariably keeping to the summit of the highest trees.

54. IANTHŒNAS GRISEIGULARIS, Walden & Layard.

Ianthœnas griseigularis, Wald. & Lay. Ibis, 1872, p. 104, pl. 6; Wald. Tr. Z. S. ix. p. 218; Sharpe, P. Z. S. 1879, p. 316.

Hab. Luzon (*Gevers*); Guimaras (*Meyer*); Negros and Basilan (*Everett*); Sulu (*Burbidge*).

Mr. Sharpe says, *loc. cit.*, speaking of a single specimen of this bird brought from Sulu Island by Mr. Burbidge, "I refer this pigeon with some hesitation to *I. griseigularis*, of which I have never seen a specimen, and only know it from Mr. Keulemans' figure in 'The Ibis' for 1872. On the other hand, it is very closely allied to *I. albigularis* of the Moluccas, but differs in the greyish shade of the white throat, which is also more restricted, and in the forehead being grey with only a slight mark of lilac."

55. MACROPYGIA TENUIROSTRIS, G. R. Gray.

Macropygia tenuirostris, Wald. Tr. Z. S. vol. ix. pt. 2, p. 218;

Sharpe, Tr. Linn. Soc. n. s. Zool. i. p. 347; *id.* P. Z. S. 1879, p. 317.

Macropygia eurycerca ?, Tweedd. P. Z. S. 1878, p. 288.

Hab. Luzon (*Meyer*); Negros and Basilan (*Steere*); Mindanao (*Everett*); Sulu (*Burbidge*); Borneo ? (*Sharpe*).

Mr. Sharpe considers that this same species is found in Java and Lombok, where it is *M. emiliana* of Bonaparte; and that it occurs even in Borneo.

Two examples of this Pigeon were obtained in Sulu Island by Mr. Burbidge.

56. Turtur dussumieri, Temminck.

Turtur dussumieri, Temm. Pl. Col. 188; Wald. Tr. Z. S. vol. ix. pt. 2, p. 218; Sharpe, Tr. Linn. Soc. n. s. Zool. vol. i. p. 347.

Hab. Luzon and Negros (*Meyer*); Panay (*Steere*); Zebu, Leyte, Bohol, and Mindanao (*Everett*); Sulu (*Guillemard*); Siassi (*Guillemard*).

a–c. ♂. Sulu Island.

d. ♂. Siassi Island.

e–g. ♀. Sulu Island.

Iris bright yellow or reddish orange; bill slate-coloured; feet pinkish red. Length 29·5–30·5 centims.; wing 15·3–16·2 centims. Sexes alike in plumage.

Abundant throughout Sulu Island.

57. Gallus bankiva, Temminck.

Gallus bankiva, Wald. Tr. Z. S. vol. ix. pt. 2, p. 223; Sharpe, Tr. Linn. Soc. n. s. Zool. vol. i. p. 348.

Hab. Luzon and Guimaras (*Meyer*); Panay (*Steere*); Mindanao and Basilan (*Everett*); Sulu (*Guillemard*); Celebes (*Wallace*).

a–c. ♂. Sulu Island.

Iris ruddy; wattles brilliant red; bill dark horn; feet bluish-black. Wing 23·0–24·0 centims.

This jungle-cock, though very numerous on Sulu Island, is but rarely seen, owing to its haunting the thicker jungle and being very shy. The natives snare it in numbers by tying up a captive in well-known haunts of the species, and surrounding him with springes. The wild birds, attracted by his crow, come down to fight, and are quickly caught. In this manner it is only the cock bird that is ever secured. I have never seen the hen, though I have had as many as ten cocks tied up to the posts of the verandah. After a few days' captivity they become even tamer than domestic fowls, and are freely crossed with the latter by the natives. The cocks have sickle-feathers of extraordinary length.

58. Excalfactoria chinensis (Linnæus).

Excalfactoria chinensis, Wald. Tr. Z. S. vol. ix. pt. 2, p. 224.

Hab. Philippines (*Jagor*); Sulu (*Guillemard*); Borneo (*Mottley*); Celebes (? *E. minima*).

a–c. ♂. Sulu Island.
d. ♀. Sulu Island.

Iris bright rosy red, in the female not nearly so bright. Bill slate-blue; tarsus chrome-yellow. Length 14·0–14·5 centims.; wing 6·8–7·0 centims.

This minute Quail was to be found in abundance all over Sulu Island in the month of May, lying in the long grass in twos and threes, rarely or never in bevies. The natives snared them, and brought them alive to us in numbers for sale.

59. Gallicrex cinerea (Gmelin).

Gallicrex cinerea, Wald. Tr. Z. S. vol. ix. pt. 229; *id.* P. Z. S. 1878, p. 953.

Gallicrex cristata (Lath.), Salvad. Uccelli di Borneo, p. 340.

Hab. Luzon (*Dussumier, Cuming*); Mindanao (*Everett*); Sulu (*Guillemard*); Borneo (*Mottley*).

a. ♂. Sulu Island.

Iris brown; bill brown, pale beneath; feet dark brown.

60. Erythra phœnicura (Forster).

Erythra phœnicura, Wald. Tr. Z. S. vol. ix. pt. 2, p. 229; *id.* P. Z. S. 1877, p. 833, 1878, p. 953; Salvad. Ucc. di Borneo, p. 340.

Hab. Mindanao (*Everett*); Sulu (*Guillemard*); Celebes (*Forster, &c.*); Borneo (*Doria, Beccari, &c.*).

a, b. ♂. Sulu Island.
c, d. ♀. Sulu Island.

Iris bright pinkish red; bill pea-green, base of upper mandible scarlet; tarsus dull yellow.

This widely distributed Gallinule was common along the Meimbun river. Some examples have the forehead white; in others it is black, or with only one or two scattered white feathers.

61. Hypotænidia striata (Linnæus).

Hypotænidia striata, Wald. Tr. Z. S. vol. ix. pt. 2, p. 232; *id.* P. Z. S. 1877, pp. 768, 884; Salvad. Uccelli di Borneo, p. 336.

Rallus striatus, Linn. S. N. i. p. 262 (1766), ex Briss.

Hab. Luzon (*Gevers*); Zebu, Leyte, and Mindanao (*Everett*); Sulu (*Guillemard*); Celebes (*Wallace*); Borneo (*Mottley, &c.*).

a. ♂. Sulu Island.
b. ♀. Sulu Island.

Iris orange; bill brown, with the proximal and inferior part bright red; tarsus leaden black. The female is a paler bird, and has the barring of the entire upper surface and wings much less marked. Beneath, the barring in the male extends much higher up than in the female.

62. Rallina euryzonoides (Lafresnaye).

Gallinula euryzonoides, Lafr. Rev. Zool. 1845, p. 368; *Rallina euryzonoides*, Tweedd. P.Z.S. 1877, p. 767; 1878, pp. 288, 345.

Hab. Luzon? (*Cuming*); Negros, Leyte, and Zebu (*Everett*); Sulu (*Guillemard*).

a. ♂. Sulu Island.

Iris orange; bill slate, base of lower mandible pea-green; tarsus olive-green.

From the absence of any marked ruddy tinge on the back, and from the colouring of the feet and tarsi, I have referred this Sulu specimen to *R. euryzonoides*, though I have had no opportunity of comparing it with that species. The black and white barring of the abdomen is broader than in *R. fasciata*, the feet of which species are described by Doria as being of a lovely carmine.

63. Ardetta sinensis (Gmelin).

Ardetta sinensis, Wald. Tr. Z. S. vol. ix. pt. 2, p. 237; Salvad. Orn. della Pap. p. 363.

Hab. "Philippines" (*Schlegel, Leschenault, Mus. Lugd.*); Sulu (*Guillemard*); Celebes (*Meyer*); Borneo (*Schwaner*).

a. ♂. Sulu Island.

Iris yellow; bill yellowish, culmen black; feet bluish black, marked with green.

64. Demiegretta sacra (Gmelin).

Demiegretta sacra, Tweedd. P. Z. S. 1877, p. 551; Wald. Tr. Z. S. viii. p. 100.

Hab. Zebu (*H.M.S. 'Challenger'*); Sulu (*Guillemard*); Celebes (*Von Rosenberg*); Borneo (*Mottley*).

a. ♂. Sulu Island.

Iris yellow; bill and tarsus lead-colour. This example has a few white feathers on the throat and chin. The species is fairly abundant in Sulu, but I have never seen them in the numbers in which they are found on the northern coasts of Celebes. In this latter country they frequent the sandy mouths of the rivers in small flocks, in which the white varieties are not unfrequently to be seen.

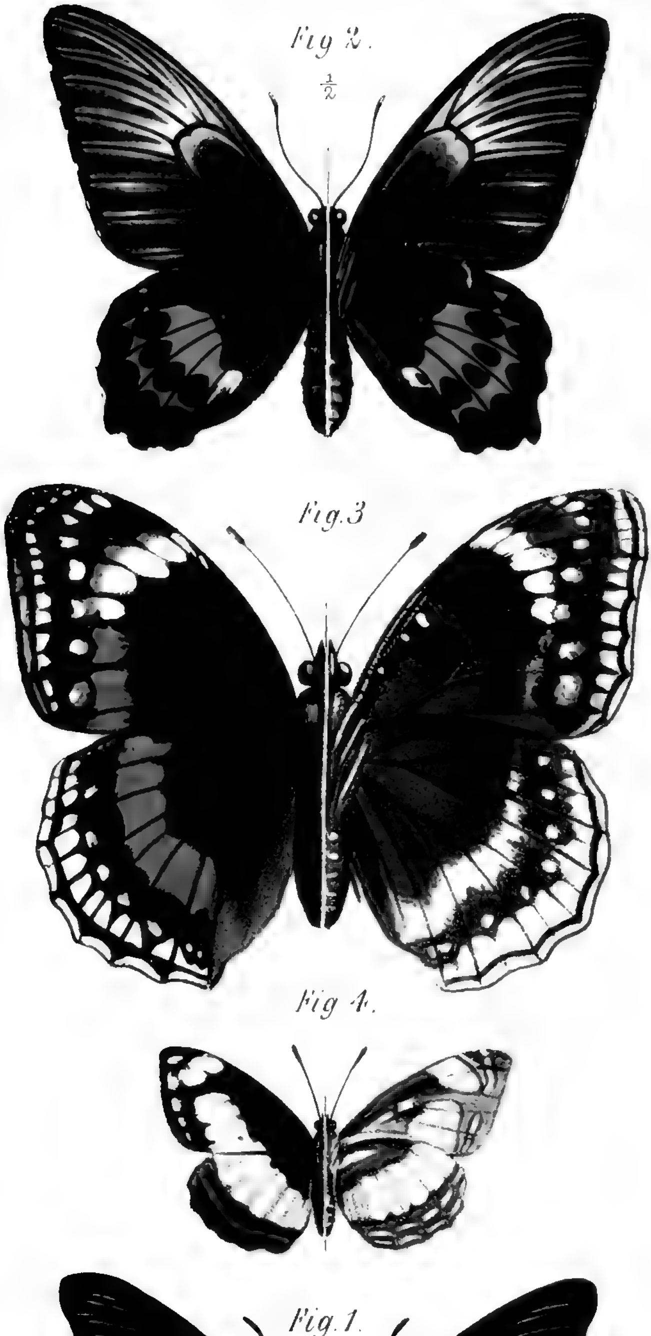
65. Butorides javanica (Horsfield).

Butorides javanica, Wald. Tr. Z. S. vol. ix. pt. 2, p. 237; *id.* Tr. Z. S. viii. p. 100.

Hab. Luzon (*Jagor*); Negros (*Steere*); Zebu, Leyte, Dinagat, Mindanao, and Palawan (*Everett*); Sulu (*Guillemard*); Celebes (*Forsten, &c.*); Borneo (*Mottley*).

a, b. ♂. Sulu Island.

Iris orange-yellow; bill black, base of lower mandible yellowish; bare skin round eye greenish; feet and tarsus orange-yellow. Length 46·0 centims.; wing 17·3 centims. Salvadori (Orn. della Pap.) gives the colour of the feet as "*flavo-virescentibus*;" in Mr. Everett's Zebu bird (♂) they were "dull dark chrome;" in one



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NEW BUTTERFLIES FROM TIMOR LAUT.

from Mindanao (sex not given) "dull green;" while in a ♀ example from Dinagat they were "bright chrome-yellow."

The Sulu birds, both of which are adult males, have the head very dark green. The wing-coverts are edged with fulvous.

During my residence on Sulu Island I several times saw, but failed to obtain, a species of Hornbill with a white head and tail (? *Cranorrhinus leucocephalus*), and I am inclined to believe that there are two species of the Bucerotidæ in Sulu. With regard to Pigeons, I could hear nothing of the existence of *C. nicobarica*, but I obtained a large *Macropygia* unknown to me, which I unfortunately lost before any notes could be taken of it. Owls were apparently not uncommon, as also a species of *Caprimulgus*. Mr. Burbidge, in his notes on his collection from Sulu, speaks of the Fire-back Pheasant as being among the birds he "saw, but could not secure;" but I cannot help thinking that he must have been mistaken on this point.

2. On the Butterflies of Timorlaut. By TH. KIRSCH, Custos for Entomology at the Royal Zoological Museum of Dresden. (Communicated by Dr. A. B. MEYER, C.M.Z.S.)

[Received February 16, 1885.]

(Plate XIX.)

In the list of Butterflies from Timorlaut, published by Mr. Butler (Proc. Zool. Soc. 1883, p. 366), 21 species from that island group are enumerated. The collections of Mr. Riedel from Timorlaut, presented to the Royal Zoological Museum of Dresden, contain examples of four more species from there, two of which and a variety are undescribed.

1. ORNITHOPTERA RIEDELI, nov. sp. (Plate XIX. fig. 1 ♂, 2 ♀.)

Ornithopteræ darsio, *Gray, valde affinis, sed distincte diversa forma et plaga alarum posteriarum. Annulo collari maculisque pectoralibus sanguineis sicut* O. darsii*; abdomine subtus segmentis postice flavo-atomatis.*

♂. *Alæ anticæ supra holosericeo-nigræ, margine interno latiore et externo breviore quam* O. darsii, *subtus venis trans cellulam discoidalem griseo-limbatis. Alæ posticæ margine exteriore minus sinuato, angulis apice venæ medianæ ejusdemque ramorum minus prominentibus, potius plane rotundatis; plaga magna discoidali aureo-flava, certo situ leviter opalescente, extus* 10-*dentata, intus basin versus oblique truncata, venis in maculas septem divisis, macula antica trapezoidali, illa cellulæ discoidalis subtriangulari, lateribus curvatis, ceteris quinque apice emarginatis.*

♀. *Alæ atro-fuscæ, holosericeæ, lunulis anguste albo-ciliatis;*

anticæ vena discocellulari late venisque secundariis usque ad ramum medianæ secundum (hoc solum dimidia externa) angustius albo-limbatis, subtus ut supra; posticæ medio plaga aureo-flava, venis tribus in maculas quatuor extus profunde emarginatas, intus prima et quarta leviter, sinuatis, secunda et tertia (illa versus basin magis attenuata quam tertia) obtusis, extus juxta quartam macula parva albo-farinosa, serie intramarginali macularum triangularium, interdum geminato-confluentium, flava, magis minusve atomatis nigris crebre conspersa, apice cellulæ discoidalis macula flava minima (punctiformi) aut nulla; subtus signaturis iisdem, sed serie externa a margine posteriore magis remota quam O. darsii *et macula antica cellulæ costalis lineiformi.*

This is a very distinct species, allied to *O. darsius*, Gray, and *O. criton*, Feld., but differing in the above particulars.

I have named this species in honour of Mr. Riedel, to whom the Dresden Museum is indebted for so many valuable additions.

2. Diadema alimena, L., var. salvini, ♀. (Plate XIX. fig. 3.)

Allied to *D. alimena*, var. *velleda*, Cr., from Amboina, and to *D. forbesii*, Butler, from Timorlaut.

On the upper side the blue band, traversing both wings, very much resembling the typical form of *D. alimena*, but differing in the white markings being throughout larger, also the interstice between the submarginal spots and the inner row of points much smaller. The differences become more remarkable on the underside, viz. fore wing: the two posterior spots, situated between the median branches, are surrounded by blue atoms, and the blue band, crossing the median nervules, is not continuous, but here and there rather evanescent; hind wing: the dark interstice between the two white cross bands is much narrower, because the outer band nearly reaches the row of round bluish-white spots, at least at the anal half.

Length of body 25, of fore wing 40 millim.

3. Athyma gracilis, nov. sp. (Plate XIX. fig. 4.)

Male. Upper side smoky black, markings creamy-white; fore wing with two oblong connected spots, oblique from costal margin near the apex, and with four, forming a cross band, which reach the middle of the posterior margin (the three first spots subequally, the fourth narrow and somewhat longer), finally with an ill-defined marginal and submarginal spotted line.

Hind wing with broad white inner band, covering the middle third, and with a narrow outer band nearly evanescent.

Underside dusky ferruginous; markings the same as above, but the fore wing with a discoidal streak, straight, small and long, interrupted near the apex; the hind wing at base of costa and mediana white, the marginal lines more defined and all white.

Length of body 15, of fore wing 21 millim.

Allied to *A. venilia*, L., but more slender, the broad white inner band relatively much larger.

4. Attacus atlas, L. 1 ♂.

The vitreous spot of the fore wing with a very obtuse angle towards the costa; exterior angle acuminated, interior side convex, exterior side concave; the vitreous accessory spot small, lineal, along the middle hardly transparent, not reaching the outer cross band. The vitreous spot of the hind wing forms nearly a regular triangle, the posterior margin of which is rather sinuated.

There are now 25 species of Butterflies known from Timorlaut, no doubt only a small part of those there existing.

3. Notes on Peruvian Birds. By Prof. W. Nation, C.M.Z.S.

[Received February 27, 1885.]

1. Petrochelidon ruficollis (Peale).

Some twenty years ago an American engineer, engaged by the Peruvian Government to survey the Andean valleys and coasts of Peru for railway routes, showed me a letter from his friend the late Mr. John Cassin, requesting him to examine carefully the rocks and cliffs for a Swallow's nest. He informed me that he had searched for it for two or three years without success.

Many years after, when the subject of Mr. Cassin's letter had almost escaped my memory, being in the National Library of Lima, looking over some books which had just arrived, I found the two volumes of Birds of the U. S. Exploring Expedition, and saw the description of the Swallows obtained by Peale, near Callao, in, I think, 1835, and named by him *Hirundo ruficollis*. With this information I recommenced my search for it.

One would naturally suppose that if a Crag-Martin had been found in Western Peru, its breeding place would be found in one of the Andean valleys, where everything necessary for its economy abounds. Such at least was my impression; and from this error I lost many years in searching for it in places which it rarely or perhaps never visits.

At length, in 1877, tired and fatigued by a long ramble over the hot sandy hills of the neighbourhood of Lima, I came to some old ruins of a brick- or lime-works, so old that the ditches that had onc supplied it with water had in many places disappeared; it must have been abandoned for a quarter of a century at least. Here, while sitting down inside the old kiln, I observed a bit of earth adhering to the wall; on removing it and blowing away carefully the loose particles of dust, I saw that it was composed of pellets, and that these pellets could not have been formed by any insect. I felt convinced that I had discovered the object of so many fatiguing journeys. Every rock, wall, and building near the ruins was carefully examined by me; and in the course of the day, about twelve miles from the city I fell in with a large colony of Cliff-Swallows.

On the following day I returned with a man and a ladder. The house which this bird had selected for its breeding place was a little Gothic building used for a telegraph and railway station, so near the line that I observed that the nests were surrounded by the smoke of the engine. The man in charge of the station informed me that the building had been scarcely finished before it was taken possession of by the colony. In the neighbourhood there was a large sugar plantation with many buildings, of which the roofs and walls had been taken possession of by *Atticora cyanoleuca*, but not a nest of the Cliff-Swallow could be seen on them. On examining the nests, I found them in every stage of construction, from the first circular row of wet pellets to the perfect nest inhabited by a family of young birds nearly fledged. On the outside (for the roofs inside had been taken possession of also) I counted 123 nests. The rafters under the eaves were covered by the nests in many places. The nests were placed one upon another. The sill of one window had a row of nests upon it; and I observed one or two nests affixed to the sides of the walls of the house.

The nest is very large for so small a bird. The one I removed weighs two pounds; it stands 7 inches high, and is $6\frac{1}{2}$ inches wide at the base. The neck is about $2\frac{1}{2}$ inches long and 2 wide. The lining is very scanty, scarcely sufficient to cover the bottom of the nest, and is composed of a few bits of fine grasses with one or two feathers. The eggs which I found in this nest, in which incubation had many days commenced, were three in number, white, thickly speckled with reddish-brown; they are ten twelfths of an inch long by seven broad.

I never saw anything more beautiful than the appearance of a colony of these birds in their curious-shaped nests, out of which project the heads of the owners at the slightest alarm. It is by no means a shy bird; while I was examining the nests they flew around me like bees, almost touching my face, uttering piteous cries. I felt sorry to see the distress of the parent birds whose nest I removed.

Of the nest I brought away I made a drawing, and sent copies of it to almost every part of Peru, and in a short time I was in possession of many important facts respecting its range in Peru. Unfortunately about this time difficulties between Chili and Peru commenced, and soon after broke out the terrible war of the Pacific. Personal observations and postal inquiries became impossible. Since the departure of the Chilian army and the return of the Peruvian authorities, I have done all I could to add to my knowledge of its range and habits; but I regret to say with little success. The colony I first discovered was swept away; the bones of many of my friends are laid under the battle-field; and the state of the country renders it unsafe to stray far from the city gates.

According to my present knowledge of this species it seems to be confined to the cultivated lands in the river-districts of the narrow strips of arid country situated between the Pacific and the mouths of the Andean valleys, from the southern border of the great desert of Sechura to the desert of Ica, from about 7° to 13° S. latitude. It is remarkable that I have never been able to obtain any evidence that it builds its nest on a rock or cliff, or that it is seen inside the mouth of the Andean valleys. The nest is always found on human habitations. In the vicinity of Lima and within twelve miles of the walls there are at present fourteen colonies.

I hope to give a fuller account of this interesting species soon.

2. Psittacula andicola, Finsch.

This robust little mountain Parrot, which seems to be peculiar to the higher parts of the Western valleys of Peru, is found in the valley of the Rimac wherever vegetation can be seen on the mountain-sides. It associates in parties of from 5 to 50 individuals; when disturbed flies to a short distance, and generally alights upon a bush of the greenish foliage.

In its habits it resembles so much the common coast species (*Brotogerys aurifrons*) that I have always considered it, whenever I have seen it feeding in its habitat, to be of the same species. Mr. Dallas mistook it for *B. aurifrons* also, and sent me excuses for sending such a common bird. It is remarkable that two Parrots specifically and generically distinct should resemble each other so closely in colour, form, and habit, and inhabit, one the lower part of a valley, and the other the upper part of it. The tail of this species is very peculiar. My first impression, on seeing it, was that the two middle tail-feathers had been lost. The wing also seemed to be disproportionally long. These striking peculiarities are lost in the most carefully prepared skin; whilst dissecting it I observed that the skin (not as observed in any other Parrot) was quite green on both surfaces. Irides black; bill yellowish green.

Total length $6\frac{6}{10}$ inches, wing $4\frac{4}{10}$.

[Two skins of this species forwarded to me by Prof. Nation agree well with others in my collection from Paucartambo (*Whitely*) and Punamarca (*Jelski*). Cf. P. Z. S. 1874, p. 679.—P. L. S.]

3. Cypselus andicola.

This beautiful Swift inhabits the western valleys of the Peruvian Andes from 6000 feet to 13,000. Mr. Dallas found large flocks of this species flying over meadows at 8000 feet, in October 1883. In February 1884 it had disappeared from the place where it was found by Mr. Dallas, and was seen at 13,000 feet in the same valley. All the birds found near the Cordillera during warmer months of the year descend the valleys on the approach of winter.

My present knowledge of this bird is very imperfect: I have traced it in the western valley of the Andes more than 300 miles to the south of Lima and a little more on the north. I have also discovered that it is found on the other side of the Andes, and that it breeds at high altitudes under the eaves of houses. I have written to a German gentleman, under the roof of whose house it is said to build its nest, to send me an account of its habits; but I have received no answer yet. Bill black; irides black.

Total length $5\frac{6}{10}$ inches; wing $5\frac{9}{10}$.

[I have previously only seen examples of this fine Swift from as far north as Arequipa and Tinta in Peru (P. Z. S. 1868, p. 569). Mr. Nation's skin agrees with Whitely's specimens.—P. L. S.]

4. Revision of the Phytophagous Coleoptera of the Japanese Fauna: Subfamilies *Cassidinæ* and *Hispinæ*. By the Rev. H. S. Gorham, F.Z.S.

[Received March 4, 1885.]

In Mr. G. Lewis's Catalogue of Coleoptera from the Japanese Archipelago, published in 1879, he has enumerated eleven species of *Cassidinæ* and three of *Hispinæ*; of the former, two must be considered synonyms, reducing the number of species then actually known to nine. In the present account of these groups, eighteen species of *Cassidinæ* are recorded and four of *Hispinæ*. It is not probable, Mr. Lewis thinks, that further investigation will very greatly increase the number; a few of the species known to inhabit Siberia will probably be found in the northern parts of the islands.

Compared with the European and Asiatic and with the North-American faunas, it appears to me that Japan has the proportion of species we might expect, or more in proportion if the area alone is considered; and if we consider the genera hitherto observed, it is evident that there is more of the Eastern and Tropical element than of the North American. Europe possesses but one genus of *Cassidinæ*, viz. *Cassida*, while in Japan we have the distinctly Old-World tropical genus *Aspidomorpha*, with *Coptocyclæ* of Eastern type. When, however, the northern islands of Yezo and Saghalien have been as fully explored, it is probable that some species may be found to modify this view.

The number of species here treated of is too small to admit of generalization to any extent; but I see no reason to modify the view I have already expressed, when reviewing the Malacodermata of the same region (Trans. Ent. Soc. 1883, p. 393). The number of species which may have been derived is perhaps larger here than in some groups; but these forms are usually sufficiently different from their representatives in distant localities to show that long-continued isolation has resulted in some permanent modification of the species, and a few species appear to be really endemic.

Cassidinæ

Aspidomorpha.

Aspidomorpha difformis.

Aspidomorpha difformis, Boh. Mon. Cass. Supp. p. 277; Baly, Trans. Ent. Soc. 1874, p. 211; Kraatz, Deuts. ent. Zeits. xxiii. p. 270 (1879).

Deloyala difformis, Mots. Etudes Ent. ix. (1860) p. 27.

Hab. Manchuria; Eastern Siberia; Japan, in all the islands (*G. Lewis*); Nikko (*Pryer*).

Aspidomorpha elliptica.

Late ac concinne ovata, antice et postice æqualiter rotundata, dia-

phana, dilute testacea, elytrorum disco ramulos antice ad humeros, postice ad margines, emittente, nigro-piceo, ad suturam testaceo irrorato, antennis articulis duobus apicalibus nigris.

Long. $6\frac{1}{2}$–$7\frac{1}{2}$ millim., lat. 6.

Hab. Japan, Niigata, in the main island (*G. Lewis*).

Compared with *A. difformis*, this species is smaller, more decidedly elliptical in form, and the elytra scarcely form a point; there is, indeed, a small tubercle in some specimens; their disk and its branches are very dark, but in two of four specimens before me they vary in being as light as in *A. difformis*; the rami, however, are much narrower. In *A. difformis* the elytra, being more developed, are very distinctly wider than the thorax; that is not so in the present species, nor do any of the specimens show a tendency to be *oval*, *i. e.* more acuminate towards the apex of the elytra than in front. Four specimens; all found at Niigata.

Cassida.

Cassida rugoso-punctata.

Cassida rugoso-punctata, Mots. Bull. Mosc. 1866, i. p. 177 [1]; Kraatz, loc. cit. p. 273.

Crassida erudita, Baly, loc. cit. p. 212 [2]; Lewis, Ann. & Mag. N. H. 1879, p. 465.

Hab. Japan[1], Yokohama[2] (*Pryer*); Miyanoshita, Oyama, Hakone, localities in Central Japan (*G. Lewis*).

Mr. Lewis has with reason united these species, Mr. Baly's type of *C. erudita* being simply a discoloured specimen. Mr. Lewis met with about a dozen examples of *C. rugoso-punctata*; they vary in size from 7 to $8\frac{1}{2}$ millims. in length. The posterior angles of the thorax are, as Mr. Baly describes them, acute, rather than as Motschulsky says "*rectis*;" and this character alone, as well as the black femora, will easily separate it from European specimens of *C. equestris*; but in three specimens of the latter species met with by Mr. Lewis in Japan the femora are black.

Cassida equestris.

Cassida viridis, Linn. Faun. Suec. p. 152 (1761).

Cassida equestris, Fabr. Mant. Ins. i. p. 62; Bohem. Cass. ii. p. 474.

Hab. Northern Europe; Japan, Agematzu.

Three specimens, which in every respect seem identical with the species known to us and on the continent of Europe as *Cassida equestris*, except that the femora are black, were found by Mr. Lewis at Agematzu, in the main island.

Cassida nigro-guttata.

Oblonga, parum ovata, supra sordide viridis, subtus nigra, prothorace transverso elytrorum latitudine, angulis posticis obtuse rotundatis, crebre rugose punctato; elytris inæqualibus, costulatis, grosse irregulariter punctatis; sutura pone scutellum gut-

tisque quinque, duabus basalibus, duabus discoidalibus, et una longiori submarginali pone medium, nigris ; antennis nigris, articulis secundo ad quintum testaceis ; capite, corpore et pedibus nigris fortiter sat crebre punctatis ; abdominis lateribus haud distincte testaceis.

Long. 7 millim. ♂ ♀.

Hab. Japan (*G. Lewis*).

This new *Cassida* is not very nearly allied to any yet recorded from Japan or Siberia. It may easily be recognized by the elytra with one long smooth costa near the suture, which, commencing at the base, nearly reaches the apex; two other raised interstices, forming costules, start, one from inside, the other from the summit of the humeral callus; but these are shortened and confused with the rugose sculpture sooner than the sutural one. The thorax is longer proportionally than that of *C. equestris*, to which, in having its hind angles rounded, it may be compared; but these angles are more suddenly cut off, as it were truncated, and the whole surface is very much more coarsely punctured. In one of the two examples, in which the thorax is quite as wide as the elytra, there are two pale spots, which Mr. Lewis observed in life to be of a fine green-yellow; this, I think, from its form and from the sixth segment of the abdomen being distinct, to be the male. The suture is a little raised and there is a deep sutural stria, between which and the first costa there is an obsolete interstice and stria. The two basal black marks are small spots, the external one elongate; the two discoidal ones are elongate dashes in line, but not united; the submarginal one is as long as these would be if united, and curved towards the apex. Legs very distinctly punctured.

Two specimens; found in Central Japan.

Cassida nebulosa.

Cassida nebulosa, Linn.; Boheman; Baly, loc. cit. p. 213; Kraatz, loc. cit. p. 270.

Japan; Kawatchi (*G. Lewis*).

Apparently rare in Japan. Mr. Lewis only met with one example in 1881 at Wadatoge.

Cassida fusco-rufa.

Cassida fusco-rufa, Mots. Bull. Mosc. 1866, i. p. 178; Kraatz, loc. cit. p. 268.

Cassida consociata, Baly, loc. cit. p. 213.

Japan, Central and South Japan (*G. Lewis*).

Cassida vespertina.

Cassida vespertina, Bohem. Cass. Suppl. p. 357; Baly, loc. cit. p. 213.

Japan (*G. Lewis*).

Very rugose; thorax marked with black at the angles and on the disk, very little shining; elytra rising to a point, with diverging rugæ, which enclose six areolets around this point; opaque; a minute yellow mark very near the apex, and the sides widely yellow.

Two more specimens, one agreeing in size with the specimen from Hiogo, the other a little smaller, were brought by Mr. Lewis from Kiga and Seba on the main island.

This species is of the form and size of *Coptocycla* (*Deloyala*) *clavata*, with which it seems to me it ought to be placed; indeed, I should have thought it was evidently a *Coptocycla*.

CASSIDA RUGIFERA.

Cassida rugifera, Kraatz, loc. cit. p. 274.

Japan.

Described from a single example, 5 millim. in length, and not compared with any other species.

"*Subrotundata, leviter convexa, dilute rufo-ferruginea, nitidula, elytrorum disco obsolete piceo-maculato, irregulariter piceo-marginato, prothorace transverso, minus brevi, basi ante scutellum leviter producta, truncata, utrinque leviter sinuata, lateribus fortius rotundatis, disco linea fere semicirculari antemediana impresso, obsolete punctato, elytris thorace paullo latioribus fortius punctato-striatis, punctis subtransversis, hinc inde rugis conjunctis, basi vix retusis sed ad scutellum oblique impressis, margine modice explanato obsolete punctato, rugis nonnullis (ad basin, medium et pone medium) discoidalibus magis elevatis. Long. 5 millim.*"

COPTOCYCLA.

COPTOCYCLA BIRAMOSA.

Coptocycla biramosa, Bohem. Cass. iii. p. 418[1], Kraatz. *loc. cit*. p. 272[2].

Hab. Pulo-Penang[1], Japan[2].

Common in the island of Kiushiu (*G. Lewis*).

COPTOCYCLA LEWISII.

Coptocycla lewisii, Baly, *l. c.* p. 214[1].

Japan, Hiogo[1] in main island, Hakodate and Junsai in Yezo.

A single specimen from each of the two latter localities are all that Mr. Lewis met with; they vary a little in the rugæ, which are less raised in the Junsai specimen.

COPTOCYCLA CRUCIFERA.

Copcocycla crucifera, Kraatz, loc. cit. p. 271.

Japan.

Described from a single specimen, compared with the Chinese *C. versicolor*, and about the size of *C. thais*, viz. 5 millim.

Apparently not met with by Mr. Lewis.

"*Rotundata, convexiuscula, dilute flavo-testacea, nitida; thorace subtriangulari, elytris haud multo angustiore, disco postice ante scutellum subcalloso-elevato, nitidissimo lævi ferrugineo, basi utrinque juxta scutellum leviter sinuata, elytris crebre profunde punctato-striatis (striis ad suturam elevatis) basi leviter retusis, disci elevati lateribus basi, maculis nonnullis aliis parvis disci dispersis ferrugineis, pone scutellum ruga magna cruciformi aliaque inæquali obliqua submarginali pone medium, margine late explanato, flavescenti-hyalino, confertim reticulato, humeris modice productis, apice acutis.—Long. 5, lat. 4 millim.*"

Coptocycla thais.

Coptocycla thais, Bohem. Cass. Suppl. iv. p. 463; Baly, l. c. p. 214; Kraatz. l. c. p. 271.

Hab. Northern China; Japan, many localities.

Readily known by the pale rugæ on the summit of the elytra forming an ×. Kraatz speaks of it as "very like *C. biramosa*";—I only see that it is like it in wanting a humeral dark ramus, it is much smaller, and all the dark markings are more nearly black. In one specimen the posterior ramus, which is usually so distinct on the margin of the elytra, is quite wanting. Mr. Lewis found this species commonly.

Coptocycla sparsa.

C. thaidi *affinis, sed minor, magis oblonga, sordide testacea, prothorace vitta mediana antice abbreviata, elytrorumque disco irrorato, fuscis, hoc ramulum postice emittente, parum nitidulis; corpore cum coxis nigro; capite, antennis pedibusque flavis, abdominis apice utrinque pallido.*

Long. 5–5½ millim.

Japan, Nikko and Sannohe on main island, and at Sapporo in Yezo (*G. Lewis*).

Head yellow, sometimes obscurely so, antennæ clear yellow; their apex faintly clouded; terminal joint not more infuscate than those preceding it. Thorax bone-yellow, rather transparent, hence the head shows through, causing the appearance of a vitta, which does not attain the front margin; hind angles round, base straighter than in *C. thais*; disk thickly punctured and but little shining. Elytra longer than, and not nearly so convex as, in *C. thais*, punctured in striæ, but with rugæ here and there uniting two or more interstices, but the pale rugæ forming so conspicuous an × in *C. thais* are here wanting, and the whole insect is duller. The posterior ramus, though reaching the margin, is not very distinct from above, because the margin is little expanded, and the dark markings of the disk here widen outwards, as also they do in front, though there is no front ramus; underneath this posterior spot is quite clear black and the apex of the suture has a black spot. This species is, with the exception of *C. spilota*, the smallest yet detected in Japan. It is about the size of *C. hebraica*. *C. crucifera* appears to be of the same size, but the description does not accord with that of this species, and it appears to be a much more glabrous and smooth species. In *C. sparsa* the expanded margin of the elytra is covered with deep punctures, which are confluent and interspersed with rugæ, especially near the edge of their raised disk.

A series of about a dozen were secured by Mr. Lewis.

Coptocycla sigillata.

Rotundata, breviter ovata, nitidissima, corpore subtus nigro-piceo, capite, antennis, pedibus, abdominis apice, maculisque nonnullis lateralibus testaceis; prothorace diaphano, disco convexo, glabro, *nigro-piceo, puncto ante scutellum sat profundo; elytris inæqualibus, grosse ac remote rugulosis, inter rugas fortiter punctato-striatis, disco nigro-piceo ramos ad humeros late oblique emittente; lateribus sat explanatis apiceque albido diaphanis, reticulatis.*

Long. 7, lat. 4 millim.

Japan, Kiga and Oyama (4000 ft.) on main island (*G. Lewis*).

Apparently not very like any species of *Coptocycla* recorded from Japan or Siberia, and at once to be known by its very shining surface and roughly rugulose elytra, which are, however, quite shining. The profile of the elytra is rather evenly convex; they scarcely form a point at their summit, the suture is elevated, and two rugæ at this point soon diverge, but becoming united and confused with other rugæ, enclose several areolets.

Five specimens are all I have seen.

Coptocycla vesicularis.

Coptocycla vesicularis, Thunb. Bohem. Cass. iii. p. 256; Kraatz. l. c. p. 271.

"*Rotundata, convexa, flava, nitida; prothorace lævi, basi lineis* 4 *longitudinalibus, nigris, mediis subapproximatis; elytris mediocriter subseriatim punctatis, dorso plaga magna communi, nigra, maculis numerosis circiter* 26, *inæqualibus, elevatis, flavis notata; margine sat late explanato, hyalino, confertim reticulato; abdomine medio infuscato.—Long.* 6, *lat.* 5 *millim.*"

"Von Baly nicht als japanische Art aufgeführt, durch die Zeichnung des Halsschildes und der Flgd. leicht kenntlich, die ansehnlichste der bekannten japanischen Species."

The thorax has four black lines, the middle one approximate, the disk of the elytra black, with numerous (about 26) unequal, raised, yellow marks. Length 6 millim., breadth 5.

I have not seen this species.

Coptocycla spilota.

Oblonga, parum rotundata, nitida, supra castaneo-rufa, marginibus flavis; prothorace angulis externis rotundatis, basi tenuiter; maculis tribus basalibus, una disci antica, scutello, sutura, elytrorumque maculis quinque nigris; corpore subtus nigro, capite, prosterno et pectore rufis, antennis pedibusque pallide flavis.

Long. $4\frac{3}{4}$ millim.

Japan, Nowata, between Tokio and Nikko.

Head red, antennæ with joints seven to the end thicker than the basal ones. Legs short and stout, red, spotted with darker red, and coxæ pitchy, abdomen and metasternum pitchy red but dark, punctured towards its apex, but the breast and prosternum almost smooth. Thorax above smooth and convex behind, but uneven, the exterior angle with raised margin, base bisinuate; elytra bright red, but varying, in places being brick-red, in other parts yellow or chestnut-red; suture black, but dilated into irregular spots about five in number. Three discoidal oblique spots, the middle one largest, the basal one connected with the base, and two marginal ones representing the usual rami, the front one of which is below the humeral angle, and the posterior one is rather in advance of the subapical discoidal spot. The series of punctures are nine in number, with a tenth row of large and irregular impressions in the fold where the margin commences to be expanded; the striæ are somewhat geminate, and the large punctures are at unequal distances.

A single individual of this very distinct species was brought home by Mr. Lewis, who met with it at Nowata.

Hispinæ.

The *Hispinæ* seem very poorly represented in Japan by four species, one new species having been added by Mr. Lewis since his first expedition.

Hispa.

A. *Corpus subquadratum, humeris alte carinatis, antennis pedibusque flavis.*

Hispa subquadrata.

Hispa subquadrata, Baly, Trans. Ent. Soc. 1874, p, 216.
Hab. Japan, Hiogo, Nagasaki (*G. Lewis*).

Hispa japonica.

Hispa japonica, Baly, l. c. p. 215.
Hab. Japan, Hiogo, Kawatchi (*G. Lewis*); also China (*teste Baly*).
Not met with again by Mr. Lewis.

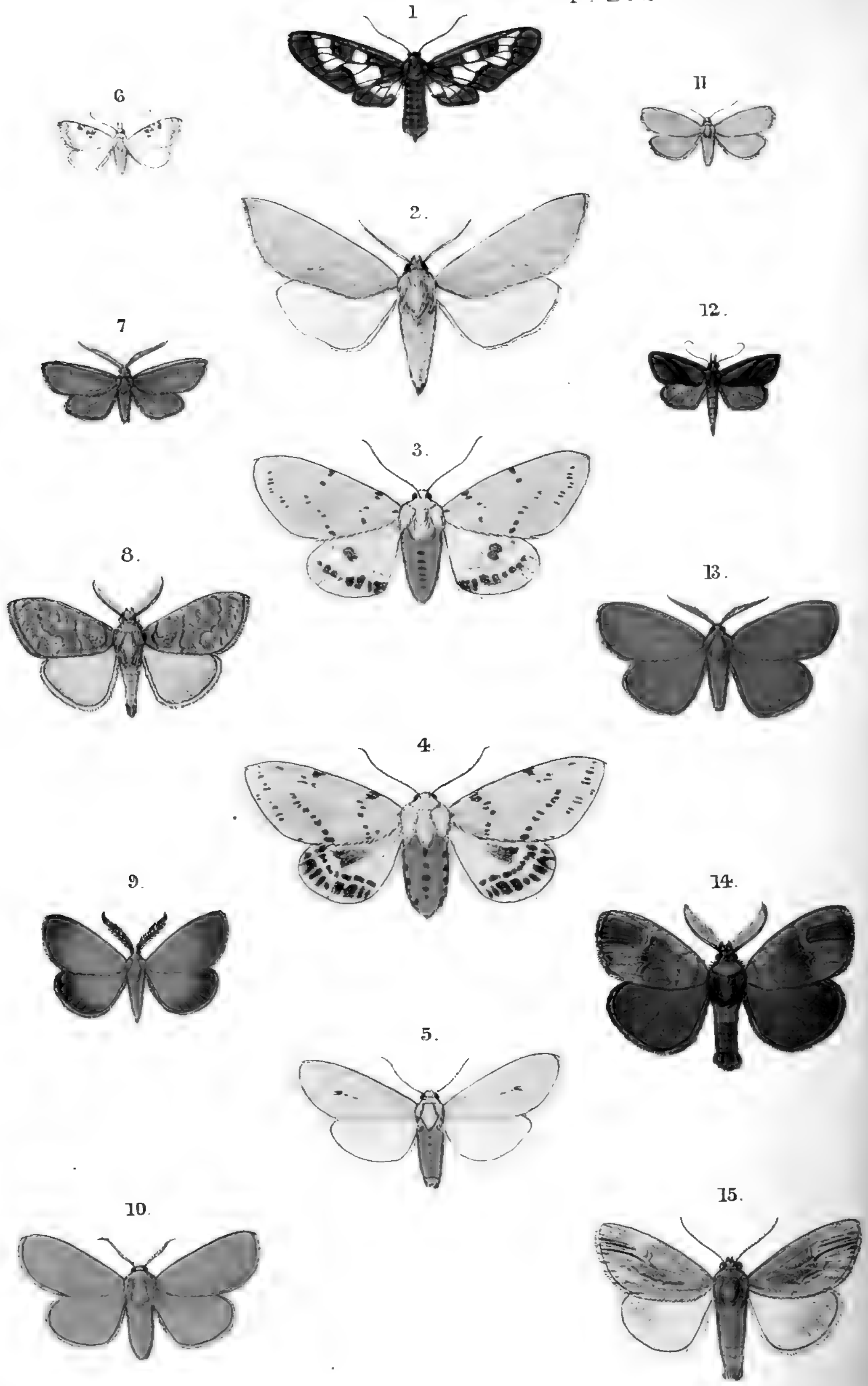
B. *Corpus oblongum, nigrum, antennis pedibusque concoloribus.*

Hispa mœrens.

Hispa mœrens, Baly, l. c. p. 215.
Hab. Japan, Nagasaki (*G. Lewis*); China (*teste Baly*).

Hispa nigrocyanea.

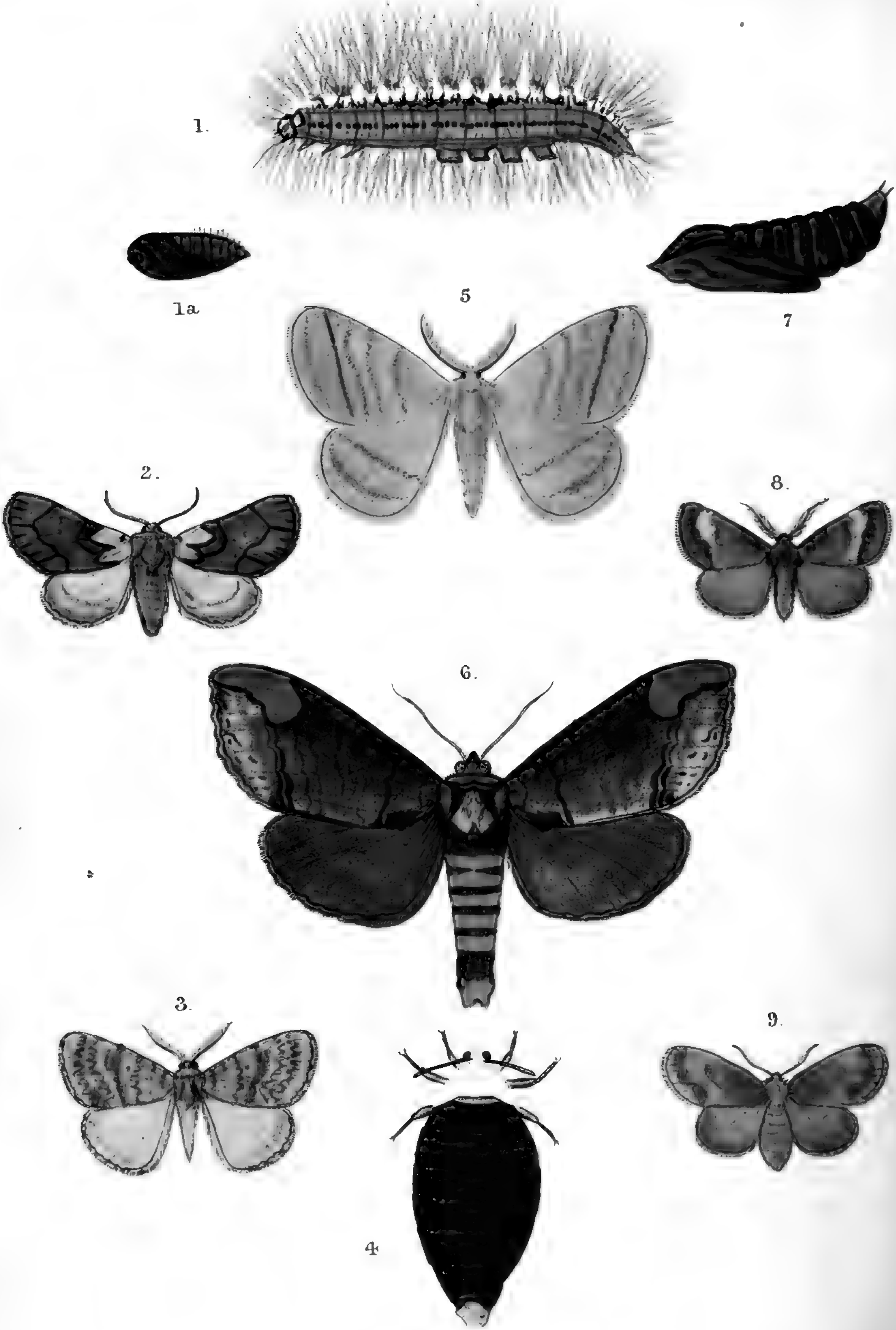
Hispa nigrocyanea, Mots. Schrenck, Reis. ii. p. 239[1], t. ii. f. 26.
Hab. Dauria[1]; Japan, Oyama (4000 ft.), Seba (*G. Lewis*).
Identified by Mr. Lewis with Motschulsky's description and figure.



F. C. Moore del et lith.

Mintern Bros. imp.

NEW INDIAN LEPIDOPTERA



F. C. Moore del et lith.

Mintern Bros. imp.

NEW INDIAN LEPIDOPTERA.

5. On the Lepidoptera of Bombay and the Deccan.—Heterocera. Part II. By Lt.-Col. C. Swinhoe, F.L.S., F.Z.S.

[Continued from p. 148.]

[Received March 5, 1885.]

(Plates XX. & XXI.)

HETEROCERA.

Sphingidæ.

1. Cephonodes hylas.

Sphinx hylas, Linn. Mant. i. p. 539.

Poona, November, February, and March; Sattara, June; Belgaum; Bombay, July; var. *S. cunninghami* also occasionally taken in Bombay and Poona.

2. Macroglossa gyrans.

Macroglossa gyrans, Walker, viii. p. 91.

Poona, May; Bombay.

3. Macroglossa belis.

Sphinx belis, Cramer, Pap. Exot. i. pl. 94. f. C.

Belgaum; Sattara, June; Bombay.

4. Nephele hespera.

Sphinx hespera, Fabr. Sp. Ins. ii. pp. 152–54.

Poona, July, September, October, and November; Sattara, June and November; Bombay, October, November, and December.

5. Panacra vigil.

Deilephila vigil, Guérin-Méneville, in Deles. Souv. Voy. dans l'Inde, pt. ii. p. 80, pl. 23. f. 1 (1843).

Poona, February; Bombay, September.

Larvæ feed on the lettuce-tree, pupal stage from 7 to 19 days. The larva spins no silk whatever, but buries itself under the fallen leaves at the foot of the tree when ready to turn chrysalis.

Larva is light green, then light chocolate-brown; some of the larvæ changed colour just before transformation, some quite early, when only an inch long: out of one lot of 7 that turned pupa, 27th, 29th, 30th October, 2nd, 6th, 11th, and 12th November, they emerged 13th, 15th, 17th, 19th, 29th November, and 1st December.

6. Deilephila livornica.

Sphinx livornica, Esper, Ausl. Schmett. ii. pp. 87, 196, pl. 8. f. 4 (1785).

Bombay.

7. Pergesa castanea.

Pergesa castanea, Moore, P. Z. S. 1872, p. 567.

Sattara, June.

8. Pergesa acteus.

Sphinx acteus, Cram. Pap. Exot. iii. p. 93, pl. 248. f. A.

Poona, January and February ; Belgaum ; Bombay.

Feeds on different kinds of *Caladium*, also feeds on *Sissus* ; larval stage about two months ; those found feeding on *Caladium* were light green, and those on *Sissus* were pink.

9. Daphnis nerii.

Sphinx nerii, Linn. Syst. Nat. i. 2, p. 798 (1767).

Poona, April and November ; Bombay, August to November.

These are much darker and brighter-coloured than those found in Sind ; the larvæ in Sind were invariably found feeding on Oleander, but in Poona they were usually found feeding on *Tabernamontana* and *Coronaria* ; some hatched 2nd April cast their first skin the next day, the second skin on the 7th, turned chrysalis on the 12th, and emerged in their perfect state on the 25th and 26th idem.

10. Chœrocampa nessus.

Sphinx nessus, Drury, Ill. Exot. Ins. ii. 46, pl. 27. f. 1.

Belgaum. Bombay, September, October, and November, very plentiful. I have often found numbers lying on the ground under the electric light on Cumballa hill.

11. Chœrocampa alecto.

Sphinx alecto, Linn. Mus. Lud. Ulr. p. 357.

Poona, February and September ; Bombay, August, September, and October.

12. Chœrocampa celerio.

Sphinx celerio, Linn. Syst. Nat. i. 2, p. 800 (1767).

Poona, June to November ; Bombay.

Has three or four broods, one after the other ; the first lot of larvæ in June, in the height of the monsoon rains, became pupæ in 14 and 15 days, and only remained in that stage about ten days ; but the last lot, in September, are much slower in growth, and more delicate : they feed for a month, and the perfect insect does not emerge till the following June ; larvæ feed on *Caladium*.

13. Chœrocampa thyelia.

Sphinx thyelia, Linn. Mus. Lud. Ulr. p. 360.

Poona, June to November ; Bombay, August to November.

The above notes apply to the transformation of this species also.

14. Chœrocampa rafflesii.

Chœrocampa rafflesii, Butler, Trans. Zool. Soc. ix. p. 556 (1876).
Poona, November and December; Bombay, September.

15. Chœrocampa oldenlandiæ.

Sphinx oldenlandiæ, Fabr. Spec. Ins. ii. p. 148 (1781).
Poona, June; Belgaum; Bombay.

16. Chœrocampa clotho.

Sphinx clotho, Drury, Ill. Exot. Ins. ii. p. 48, pl. 28. f. 1 (1773).
Belgaum; Bombay, August to October.

17. Chœrocampa gonograpta.

Chœrocampa gonograpta, Butler, P. Z. S. 1875, p. 249.

Poona, March and July; Belgaum; Bombay, July, August, and September.

I received one chrysalis from Poona on the 4th November, 1882, which had then turned only a day or two, and the perfect insect did not emerge till 4th April 1883.

18. Chœrocampa punctivenata.

Chœrocampa punctivenata, Butler, P. Z. S. 1875, p. 248.
Bombay, July and August.

19. Chœrocampa lucasii.

Deilephila lucasii, Walker, viii. 141.
Bombay, September, October, and November.

20. Protoparce orientalis.

Protoparce orientalis, Butler, Trans. Ent. Soc. ix. p. 609 (1876).

Poona, June, August, September, and October; Bombay, September and October.

The larvæ feed on *Coliæ*, length $3\frac{1}{2}$ inches, colour dark greenish-olive, with seven dark reddish-brown stripes, with small ocelli between the stripes, each ocellus with a black eye; the skin has a leather-like appearance, with an absence of the beautiful shades of colour usual with the larvæ of sphinges; the pupa is dark brown, with a looped proboscis like the pupa of *Pergesa acteus*.

Larval stage 28 to 30 days, pupal stage 16 days.

21. Diludia vates.

Diludia vates, Butler, P. Z. S. 1875, p. 13.
Poona; Bombay, August, September, and October.
The Poona specimens are very small.
Expanse of wings $2\frac{9}{10}$ and 3 inches.

22. Ambulyx turbata.

Ambulyx turbata, Butler, P. Z. S. 1875, p. 252.
Belgaum.

23. Polyptychus dentatus.

Sphinx dentata, Cram. Pap. Exot. ii. 42, pl. 125. f. G.

Poona, December; Belgaum; Bombay, October and November.

Larvæ feed on *Cordia angustifolia*; when full-grown measured $4\frac{1}{2}$ inches, colour green, with ochreous stripes; one moth emerged in 26 days, in July, and two of another brood in December took 63 days in the pupal stage.

24. Acherontia morta.

Acherontia morta, Hübn. Verz. Schmett. p. 140, 1496.

Poona, June and August; Bombay, August and September.

25. Acherontia styx.

Acherontia styx, Westwood, Cab. Orient. Ent. 88, pl. 42. f. 3.

Poona, September; Bombay, September and October.

The larvæ of both the above feed on potato, jasmine, *Erythrina indica, Datura*, and *Colea*; the larvæ, when disturbed, make the same peculiar clicking noise the moth does; they average in length from 4 to $5\frac{1}{2}$ inches; larval stage 28 days, pupal stage varies from 1 to 4 months. They vary much in colour: those fed on potato were bright canary-yellow, with seven violet stripes, those fed on the other plants named were of the usual green colour with purple stripes bordered with yellow; but there was no visible difference in the moths as to sex, colour, or size, whether they came from the yellow caterpillars or from the green ones.

Zygænidæ.

26. Euchromia polymena.

Sphinx polymena, Linn. Syst. Nat. ii. p. 806, 40.

Bombay, September.

27. Syntomis extensa.

Syntomis extensa, Walker, xxxv. 1863.

Matheran, May.

28. Syntomis cupreipennis.

Syntomis cupreipennis, Butler, Journ. Linn. Soc. xii. p. 347.

Poona, July and October.

29. Syntomis passalis.

Zygæna passalis, Fabr. Sp. Ins. ii. 159, 11.

Poona, May, October, and November.

30. Syntomis montana.

Syntomis montana, Butler, Journ. Linn. Soc. xii. p. 349.

Poona, September and October.

31. Eressa musa, n. sp. (Plate XX. fig. 1.)

Bombay, February.

Allied to *Eressa confinis*, Walker. Smoky brown, a gold spot front on the thorax, a central row of gold spots on the abdomen, one on each segment; fore wings with an interior hyaline band divided into four by the veins, first within the cell and gradually widening to the hinder margin, and an outer band of the same kind divided by the veins into five parts, commencing at the costa and terminating on the second median nervule, the subcostal spot much the smallest. Hind wings with a central hyaline patch, divided into five parts by the veins. Underside, wings, body, and legs smoky brown.

Expanse of wings $1\frac{4}{10}$ inch.

32. Dysauxes indica.

Dysauxes indica, Moore, P. Z. S. 1879, p. 390.

Bombay, July.

Debos, gen. nov.

Male: fore wing elongated, narrow, costa slightly arched at the base, apex hardly acute, exterior margin slightly oblique, posterior margin slightly convex towards the base; cell extending two thirds of the length; subcostals at equal distances apart, first branch emitted at nearly one fourth before end of cell, second forked at one half its length, fourth forked at three fifths; discocellular bent; radials from the angles, a short slender discoidal veinlet emitted within the cell from the middle; the middle median from angle close to end of the cell, lower at one fifth before the end; submedian straight. Hind wing rather long, narrow; exterior margin very oblique, recurved, abdominal margin fringed, cell extending half the length; costal vein straight, forked at three fifths its length; two subcostals on a foot-stalk one fourth beyond the cell; discocellular outwardly oblique, convex, radial from the middle, a slender discoidal veinlet emitted within the cell; two upper medians from end of the cell, lower at one third; submedian and internal vein straight. Body short, moderately stout; top of head laxly clothed; abdomen slightly tufted at the apex; palpi obliquely ascending, slender, cylindrical, laxly squamose, not reaching to level of the eyes, third joint short, pointed; antennæ recurved from the base, broadly pectinated on one side only, the branches also ciliated and broadest in the middle, minutely ciliated on the other side towards the base; legs moderately stout, femora and tibiæ laxly squamose, middle tibiæ with two, and hind tibiæ with four short spurs.

33. Debos iratus, n. sp. (Plate XX. fig. 7.)

♂, above, head, fore part of thorax and antennæ chrome-yellow, branches of antennæ reddish, remainder of body and both wings pale purple-brown, quite unmarked. Underside, wings of same colour, with some blackish marks in the outer spaces near the apex of fore wings; palpi, body, and legs reddish.

Expanse of wings $\frac{9}{10}$ inch.

Agaristidæ.

34. Eusemia afflicta.

Eusemia afflicta, Butler, Ann. Nat. Hist. 1875, p. 118.
Poona, June and September.

35. Eusemia contracta.

Eusemia contracta, Butler, Ent. Mo. Mag. 1875, p. 117.
Belgaum.

36. Ægocera venulia.

Phalena venulia, Cram. Pap. Exot. ii. 107, pl. 165. f. D.
Poona, September.

Chalcosiidæ.

37. Chalcosia affinis.

Gynantocera affinis, Guér. Voy. Delessert, Hist. Nat. p. 86, pl. 24. f. 2.
Belgaum.

Nyctemeridæ.

38. Nyctemera lactilinea.

Phalæna geometra lactilinea, Cram. Pap. Exot. ii. 47, pl. 128. f. E.
Belgaum.

Lithosiidæ.

39. Lacides ficus.

Noctua ficus, Fabr. Ent. Syst. iii. pp. 27–62.
Poona, February and August; Belgaum; Mahableshwur; Bombay, August to November.

40. Damalis alciphron.

Noctua alciphron, Cram. Pap. Exot. ii. p. 58, pl. 133. f. E.
Bombay, August to November. Very plentiful.

41. Damalis strigivenata.

Damalis strigivenata, Butler, Trans. Ent. Soc. 1875, p. 321.
Poona; Belgaum; Bombay, October and November.

42. Damalis sericea.

Hypsa sericea, Moore, P. Z. S. 1878, p. 3.
Poona, November; Bombay.

Larvæ of all the above four species feed on *Ficus religiosa* and several other kinds of *Ficus*; larvæ change their skins twice at 8 days' interval from the date of hatching, length about $1\frac{3}{4}$ in.; they very much resemble each other, but the larva of *L. ficus* can be distinguished by a yellow spot on the side, rather in rear of the centre; they are regular night-feeders, hiding on the lower sides of the leaves in the body of the trees during the daytime; they make a cocoon in the crevices of the bark of the tree or in the crevices at the roots, using the bark and weaving it with the silk, not cementing it, and the moth invariably emerges just before sunset, so that they may be able to get on the wing by nightfall; they are never on the wing in daylight; they are much sought after by lizards and by bats; the caterpillars are quite common at Poona on the *Ficus religiosa*. Out of thirty reared by Mr. Taplin every moth emerged between 4.30 and 5 P.M.

43. CRAMBOMORPHA ENTELLA.

Phalæna tinea entella, Cram. Pap. Exot. iii. p. 27, pl. 208. f. D.
Bombay, September, October, and November. Common.

44. DIGAMA HEARSEYANA.

Digama hearseyana, Moore, Cat. Lep. Mus. E. I. C. pt. ii. p. 298, pl. vii *a*, 6, figs. 3, 3*a*.
Poona, February; Bombay.

45. BRUNIA CHOTA, n. sp. (Plate XX. fig. 11.)

Fore wings pale lilacine ochreous-brown; hind wings paler and of a duller tint. Body, palpi, and legs pale lilacine ochreous-brown.
Expanse $\frac{6}{10}$ inch.
Poona, October.

46. BIZONE PUELLA.

Phalæna noctua puella, Drury, Exot. Ins. ii. p. 3, pl. 2. f. 2.
Bombay, October and November.

47. ÆMENE TAPROBANIS.

Æmene taprobanis, Walker, ii. p. 542.
Poona; Belgaum; Bombay, November.

48. ÆMENE TENEBROSA.

Æmene tenebrosa, Moore, P. Z. S. 1878, p. 34.

49. BARSINE RUBRICOSA.

Lycæna rubricosa, Moore, P. Z. S. 1878, p. 30, pl. 3. f. 1.
Bombay, August, October, and November.

50. NEPITA ANILA.

Nepita anila, Moore, Cat. Lep. Mus. E. I. C. part ii. p. 302.
Poona, August; Bombay, July, August, and September.

50 a. NEPITA SEMIFASCIA.

Setina semifascia, Walker, ii. p. 521.
Bombay.

50 b. RŒSELIA PASCUA, n. sp. (Plate XX. fig. 6.)

Poona, October; Bombay, September.
Pure white above, fore wings with some brown markings on the

costa, two largish brown patches also on the costa, one before the middle and the other on the middle; an outward double sinuous line curving inwardly at its centre, a submarginal, and a marginal diffused incomplete brownish-grey band; hind wings unmarked, fringe grey; underside white, with some smoky grey coloration near the costa and apex of the fore wings.

Expanse of wings $\frac{6}{10}$ inch.

51. Deiopeia pulchella.

Tinea pulchella, Linn. Syst. Nat. i. 2, p. 884, 349.

Poona, October to January; Bombay, October and November.

52. Deiopeia pulchella, var. lotrix.

Phalæna lotrix, Cram. Pap. Exot. ii. 20, pl. 109. f. E.

Poona, July.

53. Argina syringa.

Phalæna syringa, Cram. Pap. Exot. i. 8, pl. 5. figs. C. D.

Mahableshwur, May; Belgaum.

54. Argina dulcis.

Deiopeia dulcis, Walker, ii. p. 569.

Poona, November; Sattara, November; Belgaum; Bombay.

55. Argina astrea.

Phalæna noctua astrea, Drury, Ins. Exot. ii. p. 11, pl. 6. fig. 3.
Phalæna cribraria, ♀, Cram. Pap. Exot. iii. pl. 208. f. G.

Poona, October; Sattara, November; Ahmednugger, October and November; Mahableshwur, May; Bombay, August to December. Very common.

56. Argina astrea, var. cribraria.

Argina cribraria, Clerck Scones, pl. 54. f. 4.

Poona, September; Bombay, October.

57. Argina astrea, var. notata.

Argina notata, Butler, Trans. Ent. Soc. pl. iv. p. 365 (1877).

Belgaum; Bombay, August.

58. Argina astrea, var. guttata.

Xanthestes guttata, Rambur, Faune de l'Andalousie, ii. p. 229.

Bombay, October.

Arctiidæ.

59. Rhodogastra fraterna.

Rhodogastra fraterna, Moore, Trans. Ent. Soc. 1884, p. 356.

Poona, November; Bombay, October and November.

60. Spilarctia confusa.

Spilarctia confusa, Butler, Ill. Typ. Lep. Het. B. M. pl. 85. f. 13.

Bombay, September, October, and November.

61. Spilarctia quadriramosa.

Euprepia quadriramosa, Kollar, in Hügel's Kaschmir, 468, 6.

Sattara, November.

62. Spilosoma mona, n. sp. (Plate XX. figs. 3 ♂, 4 ♀.)

Mahableshwur, May.

♂ ♀. Pale yellowish testaceous, hind wing lighter than the fore wing ; abdomen deep chrome-yellow, with a line of black spots down the centre, on each segment, beneath, wings and body paler yellowish testaceous ; coxæ bright crimson above, tibiæ black above, both pale testaceous beneath ; tarsi deep black ; fore wings above with three rows of black dots placed in pairs, first row before the middle, which in the male is composed of only three dots and in the female of six ; second beyond the middle, third submarginal.

Hind wing with the entire cell black in the female, black only at its end in the male, and with a discal and submarginal black macular band, the latter the deeper, and both bands deeper and more regular in the female than in the male ; underside, all the wings with the cells black, the male having the black only at the end of the cell in the hind wing, and with two wavy, black, deep macular bands across both wings, the first medial, the second discal.

Expanse of wings $1\frac{8}{10}$ inch.

63. Alope ricini.

Noctua ricini, Fabr. Ent. Syst. iii. 1, p. 473 (1793).

Poona, June, July, and August ; Sattara, September ; Matheran, May ; Ahmednugger, November.

Larvæ feed on *Ricinus communis* ; they had long brownish hairs ; length $1\frac{1}{4}$ inch ; larval stage 24 days ; pupal stage 21 days.

64. Alope clavatus, n. sp.

Poona, October ; Mahableshwur, May ; Bombay, July, September, and October.

♂ ♀. Head, thorax, and fore wings brown ; fore wings crossed by several macular bands of a darker shade ; hind wings and abdomen yellow, the latter with black macular bands above and below and also in the sides ; hind wing with the costa and outer margin blackish brown, and with three macular bands of the same colour ; below, the wings are coloured and marked exactly as above ; antennæ and legs blackish brown, the latter with the knees and tips yellow.

Expanse of wings , ♂ $1\frac{7}{10}$ inch, ♀ $2\frac{3}{10}$ inch.

65. Phissama transiens.

Spilosoma transiens, Walker, iii. 675.

Belgaum.

66. Rajendra khandalla.

Aloa khandalla, Moore, Cat. Lep. Mus. E. I. C. ii. p. 361, pl. ix *a.* f. 13.

Bombay, September.

67. Rajendra biguttata.

Aloa biguttata, Walker, iii. 707.

Belgaum; Bombay, August, September, and October.

68. Creatonotus interruptus.

Phalæna interrupta, Linn. Syst. Nat. 116.

Ahmednugger; Bombay, August to November.

69. Aloa sanguinolenta.

Bombyx sanguinolenta, Fabr. Ent. Syst. iii. 1, 473, 206.

Bombay, August to November.

Larvæ feed on *Ricinus communis*; they are very hairy and are $1\frac{1}{2}$ inch in length; the pupa closely resembles the pupa of *Alope ricini*.

70. Aloa moorei.

Areas moorei, Butler, Cist. Ent. ii. 23.

Bombay, September.

71. Aloa punctistriga.

Spilosoma punctistriga, Walker, iii. 676.

Bombay, August.

72. Aloa emittens.

Creatonotus emittens, Walker, iii. 638.

Poona, August to October; Belgaum; Sattara, June; Bombay, August to November.

73. Aloa flora, n. sp. (Plate XX. fig. 5.)

Bombay, November.

♀. Upper side, fore wing pale rosy testaceous, with a small black spot at the lower end of the cell and some black irrorations in the median nervure; hind wings pure white, unmarked; underside, fore wings very pale, basal two thirds of costa vermilion; hind wings pure white; thorax above same colour as fore wings, abdomen vermilion, with a row of black points between the segments down the centre; body beneath and legs pale testaceous; antennæ black above, testaceous beneath.

Expanse of wings $1\frac{1}{2}$ inch.

LIPARIDÆ.

74. **Olene mendosa.**

Olene mendosa, Hübner, Samml. exot. Schmett. iii. 19, 147, f. 293, 294.

Poona, November.

75. **Olene olearia**, n. sp. (Plate XX. figs. 14 ♂, 15 ♀.)

Poona, July and December.

♂. Glossy olive-brown, whitish beneath; antennæ brown, deeply pectinated; abdomen with a whitish raised spot above the anal tuft; thorax orange in front. Fore wings with an embossed orange spot near the base; all the veins brown; with some pale longitudinal streaks in the interspaces, especially so near the apex, giving the whole wing the appearance of a mass of longitudinal streaks from base to outer border, with the disk of the wing the darkest part of it. Hind wings with some few faint streaks, but altogether paler than the fore wings.

♀. Pale testaceous, with a slight reddish-yellow tinge; fore wings longitudinally streaked with brown throughout the centre of it; hind wings whitish, slightly streaked with brown in the centre. Underside paler, with a subapical longitudinal brown streak in the fore wings and the pale brown streaks in the hind wings showing through.

Expanse of wings, ♂ $1\frac{3}{10}$ inch, ♀ $1\frac{6}{10}$ inch.

76. **Olene fusiformis.** (Plate XX. fig. 8 ♂.)

♀. *Nioda fusiformis*, Walker, v. p. 1070.

Poona, September; Bombay, November.

♂. Antennæ deeply pectinated. Antennæ, thorax, and fore wings brown; abdomen testaceous; head yellowish. Fore wings with the outer margin paler, an embossed yellowish spot at the base; basal, median, and outer thin latitudinal lines black and indistinct, first nearly straight, second curved inwardly, third sinuous and toothed; hind wings whitish. Underside whitish, darkest towards the centre of the fore wings.

Expanse of wings $1\frac{4}{10}$ inch.

At Poona Mr. Taplin took the larvæ on *Ziziphus jujuba*; Major Pitcher, Assistant Superintendent of Agriculture N. W. P., sent me some he found feeding on imported New Orleans cotton-plants; the Poona larvæ were 25 days feeding and became from 1 to $1\frac{1}{4}$ inch in length before turning; pupal stage 9 to 15 days.

77. **Porthesia marginalis.**

Euproctis marginalis, Walker, vii. p. 1731.

Poona, September to April, very common.

78. **Euproctis decussata.**

Euproctis decussata, Moore, Ann. & Mag. Nat. Hist. 1877, p. 437.

Poona, February; Bombay, September and December.

79. Euproctis lunata.

Euproctis lunata, Walker, iv. p. 837, vii. p. 1731.

Poona, September and November.

80. Euproctis vitellina.

Liparis vitellina, Kollar, Kaschmir von Hügel, pp. 471–4.

Sattara, November.

81. Euproctis postica.

Euproctis postica, Walker, xxxii. p. 348.

Poona, March; Bombay, September and October, very plentiful.

82. Perina basalis.

Perina basalis, Walker, iv. p. 966.

Poona, October; Belgaum; Bombay, September, October, and November.

Larvæ feed on *Ficus indicus* and *F. religiosa*. The male has the outer two thirds of the fore wing hyaline, the base mouse-colour, hind wings mouse-colour with a large hyaline spot on the external angle. The larvæ and pupæ are very brilliantly coloured. The insect is very plentiful in Poona, where I reared a large number.

83. Artaxa leithiana.

Artaxa leithiana, Moore, P. Z. S. 1874, p. 399, pl. 32. f. 9.

Poona, July; Bombay, September, very plentiful.

A variable insect: varies in coloration from deep yellow to nearly white, and the macular median band is sometimes regular from costa to hinder margin, and is sometimes only represented by one or two spots.

84. Artaxa varians.

Artaxa varians, Walker, iv. p. 796.

Poona; Bombay, September.

85. Artaxa brevivitta.

Artaxa brevivitta, Moore, P. Z. S. 1879, p. 400, pl. 32. f. 10.

Poona.

86. Artaxa fraterna.

Artaxa fraterna, Moore, Lep. of Ceylon, ii. p. 85.

Poona; Bombay, August to November.

87. Artaxa scintillans.

Somena scintillans, Walker, vii. p. 1734.

Poona, October and November; Bombay, October, November, and December.

88. Aroa sagrara, n. sp. (Plate XX. fig. 13 ♂.)

Belgaum.

♂. Chocolate-brown, paler, with a tinge of yellow beneath; head above dark brown, palpi and cilia pale rosy brown above and beneath; with the outer third of wings dark, caused by all the outer veins being darker than the general colour.

Expanse of wings $1\frac{3}{10}$ inch.

89. Aroa clara, n. sp. (Plate XX. figs. 9 ♂, 10 ♀.)

Bombay, September and October.

Allied to *Aroa pyrrhochroma*, Walker. ♂: chestnut red, outer half of fore wings and outer third of hind wings smoky black, as are also the deeply pectinated antennæ; fringe red; head, body, and legs chestnut-red; below, the wings are the same as they are above. ♀: antennæ ciliated; body thick, cylindrical, extending somewhat beyond the wings; wings very slightly clothed, semidiaphanous; head, body, legs, and wings pale reddish; quite unmarked.

Expanse of wings, ♂ $1\frac{1}{10}$, ♀ $1\frac{3}{10}$ inch.

90. Lælia pallida.

Lælia pallida, Moore, Trans. Ent. Soc. 1884, p. 358.

Bombay, October.

91. Charnidas testacea.

Cycnia testacea, Walker, iii. p. 683.

Bombay, November.

92. Charnidas rotundata.

Lacida rotundata, Walker, iv. p. 802.

Poona, July and October.

93. Gynæphora xerampelina, n. sp. (Plate XXI. figs. 8 ♂, 9 ♀.)

Poona, September and October.

♂ pale reddish brown, clearer and redder beneath; antennæ deeply pectinated beneath. ♀ pale brown, with no reddish in the coloration, and with the abdomen thick and extending for one third beyond the wings. ♂ ♀, fore wings with a diffuse lunular brown mark at the end of the cell, basal half of wing suffused with brown, outer nervules of the same colour, with a brown, suffused, inwardly curved, submarginal band, ending in a small brown patch in the interno-median interspace; hind wings with a slightly darker shade towards the outer border. Underside with the discal area of all the wings slightly darker, otherwise unmarked.

Expanse of wings, ♂ $1\frac{2}{10}$, ♀ $1\frac{3}{10}$ inch.

Congeneric with and closely allied to the European *Gynæphora selenitica*.

94. Enome ampla.

Enome ampla, Walker, iv. p. 883.

Poona, October.

95. Enome incerta.

Lymantria incerta, Walker, iv. p. 880.

Sattara, June.

96. Enome detersa. (Plate XXI. figs. 3 ♂, 4 ♀.)

Lymantria detersa, Walker, xxxii. p. 365.

Poona, October, very plentiful; Belgaum, September; Sattara, November.

As Mr. Butler stated (P. Z. S. 1883, p. 156, n. 45) that the female of this species was unknown, I got Mr. Taplin, at Poona, to pay particular attention to the subject: and by digging and hunting for pupæ at the foot and in the bark of the *Acacia arabica*, where the male moth is found in great abundance, we were successful at last; a fat pupa produced a fat black apterous grub-like moth, and round the breeding-cage Mr. Taplin that night caught over three hundred males all trying to get at this female.

Subsequently he obtained an impregnated moth and tried to rear the larvæ, but a sudden change in the weather killed them all. I was away from Poona at the time, and Mr. Taplin kept no drawings. The larvæ feed on babool (*Acacia arabica*).

I have the two pupa-cases of both the females in my collection.

This insect is very plentiful above the Ghats, but I never observed it in Bombay. Walker's type came from N. India, not from the Mauritius, as is stated in his work.

97. Lymantria obsoleta.

♂. *Lymantria obsoleta*, Walker, iv. p. 880.

Poona, February and September; Matheran, May; Bombay, October.

The female is very much larger than the male, expanse of wings being, ♂ $1\frac{6}{10}$, ♀ $2\frac{6}{10}$ inch; the coloration and markings are similar. Walker's type must, however, have been a faded specimen, because the abdomen in both sexes, when fresh, is of a deep pinkish red, and not of a slight rosy tinge as described by him; the basal portion of the hind wings is also rosy, and sometimes nearly the whole of the hind wing is of that colour.

The larvæ feed on *Ficus indicus*; they turn pupæ at the foot of the tree, the pupæ being always found suspended in a net like the pupæ of *Perina basalis*.

98. Lymantria fuliginosa.

Lymantria fuliginosa, Moore, P. Z. S. 1883, p. 17.

Bombay, August to December, very common.

Notodontidæ.

99. Stauropus albescens.

Stauropus albescens, Moore, P. Z. S. 1879, p. 404.

Bombay, December.

100. Ichthyura restitura.

chthyura restitura, Walker, xxxii. p. 433.

Poona, December.

Much paler than the type; it varies, however, much in colour. I have both dark and very pale forms from Subathoo.

101. Brada truncata.

Brada truncata, Walker, xv. p. 1666.

Poona, December; Bombay.

102. Arsacia frontirufa, n. sp. (Plate XX. fig. 12.)

Bombay, November.

♂. Antennæ, palpi, head, and thorax rufous; eyes black; abdomen testaceous, with a longish anal tuft. Fore wing chocolate-brown, with the apex pale and the hinder margin broadly black, a whitish line bordered inwardly with brown from the centre of the hinder margin to the costa near the apex; costa reddish. Hind wing testaceous, basal portion palest. Underside: wings of a uniform smoky testaceous colour; body and legs pale reddish white.

Expanse of wings $\frac{7}{10}$ inch.

103. Oræsia emarginata.

Noctua emarginata, Fabr. Ent. Syst. iii. 2, p. 240.

Poona, October; Bombay, July to November.

104. Culasta indecisa.

Culasta indecisa, Moore, P. Z. S. 1881, p. 377.

Sattara, November; Bombay, July to December.

105. Beara dichromella.

Beara dichromella, Walker, xxxv. p. 1703.

Bombay, September.

106. Harpyia kandyia.

Harpyia kandyia, Moore, Lep. Ceylon, ii. p. 108, pl. 120. figs. 1–1*a*.

Bombay, December.

107. Antheua discalis.

Antheua discalis, Walker, iii. p. 767.

Kurjut (Khandala Ghats), June; Bombay, July, August, and September.

108. Corma ernestina, n. sp. (Plate XX. fig. 2 ♂.)

Bombay, August and September.

♂ ♀. Antennæ, head, thorax, and fore wings brownish grey, with a faint flesh-coloured tinge. A brownish streak along the subcostal nervure; another along the medial nervure, and another along the hinder margin; hind wings and abdomen greyish white, cilia white; underside paler, unmarked; the hind wings and body pure white.

Expanse of wings $2\frac{1}{10}$ inches.

109. Phalera bobi, n. sp. (Plate XXI. fig. 6.)

Bombay, September.

Allied to *Phalera raya*, Moore, from Darjiling. Fore wing glistening greyish brown, marked very much as in *P. raya*, but there is a deep black band on the basal third of the hinder margin, and the outer double sinuous line from the apical patch blackens into a diffused patch on the hinder margin; eyes and fore part of the head deep black, top of the head yellowish white; antennæ and thorax dark brown; sides of the thorax white; abdomen yellowish, with brown bands on each segment; hind wing above and both wings below soot-brown.

Expanse of wings $4\frac{3}{10}$ inches.

Bombycidæ.

110. Trilocha varians.

Naprepa varians, Walker, vii. p. 1153.

Poona, August; Sattara, June; Bombay, September to December.

The male is yellowish fawn-colour; Mr. Moore's drawing in pl. xi. A. f. 6, vol. ii. Cat. Lep. Mus. E. I. C., fairly represents the markings of this sex; but the general coloration is too dark; the female is pale mouse-colour with a slight reddish tint on the hind wings, the markings showing very faintly, often quite obsolete.

111. Thiacides postica. (Plate XXI. figs. 1, 1 *a* larva, 2 ♀.)

Thiacides postica, Walker, v. p. 1028.

Bombay, September to November, common.

Larva feed on *Ricinus communis*; the larva covered the walls of my garden in October; I put a number into a breeding-cage; two turned into pupæ on the 24th idem, and the moths emerged on the 20th December following; all the other larvæ hybernated at the end of October, and I took them on board ship in that state on the 6th of March following; but the cold in the Red Sea killed them all.

Limacodidæ.

112. Natada velutina.

Gastroparcha velutina, Kollar, Kasch. von Hügel, p. 473, 3.

Poona, July.

113. NATADA BASALIS.

Natada basalis, Walker, v. p. 1110.
Bombay, July.

114. PARASA LEPIDA.

Phalæna-noctua lepida, Cramer, Pap. Exot. ii. p. 50, pl. 130. f. E (1779).
Bombay, October.

115. APHENDALA CANA.

Parasa cana, Walker, xxxii. p. 484.
Poona, June, July, and October.

116. CANDYBA PUNCTATA.

Candyba punctata, Walker, vii. p. 1761.
Belgoræa subnotata, Walker, xxxii. p. 497.
Poona.

LASIOCAMPIDÆ.

117. EUPTEROTE GYRA, n. sp.

Belgaum.
Allied to *E. mutans*, Walker.

♂ of the same yellow colour, the internal bands are less toothed, and the outer double straight band, instead of being composed of two thin lines, is composed of one broad purple band and of a faint indication of a duplicate thin line. Underside is altogether different, having a suffused broad purple band on the costa of both wings, and a broad discal purple band across both wings in addition to the usual markings.

Expanse of wings $4\frac{2}{10}$ inches.

118. EUPTEROTE UNDATA.

Bombyx undatus, Blanchard, Jacq. Voy. dans l'Inde, Zool. Ins. p. 23, pl. 1. f. 8 (1844).

Poona, July; Belgaum; Khandala, April.

Larvæ feed on *Dracæna ferrea*, *Acalypha emarginata*, and *Graptophyllum hortensis*; they cast their skins every 8 or 9 days for the first 80 days, getting darker each time—larval stage 120 days; they are night-feeders, are very hairy, and require very careful handling; their hairs run into the skin and cause great irritation.

119. EUPTEROTE DIABOLICA, n. sp.

Belgaum.

♂ dark brown, with the markings above and below as in the pale yellow *E. mutans*, Walker.

Expanse of wings $4\frac{6}{10}$ inches.

120. Eupterote discrepans.

♂ *Tagora discrepans*, Moore, Trans. Ent. Soc. 1884, p. 360.

Bombay, August to September.

♀ has the entire surface of both wings diffused with reddish, the space beyond the discal line being so dark as to form a deep marginal band; the antennæ, head, thorax, abdomen above and below, and all the legs are dull yellowish red.

Expanse of wings 4 inches.

121. Eupterote undans.

Dreata undans, Walker, iv. p. 905.

Mahableshwur, May.

122. Eupterote similis.

Eupterote similis, Moore, Trans. Ent. Soc. 1884, p. 369.

Poona, June.

123. Eupterote mollis.

Eupterote mollis, Moore, Trans. Ent. Soc. 1884, p. 367.

Bombay, August to September.

A very pretty local species. I have never met with it except in Bombay, where it is very plentiful; I have seen the ground under the great electric light on the Malabar Hill covered with them at night.

124. Messata translata, n. sp. (Plate XXI. fig. 5 ♂.)

Sattara, June.

♂ reddish yellow, fore wings with four latitudinal straight bands across the wings, composed of brown raised atoms—inner, central, outer, and submarginal; hind wings with only two bands, central and outer; underside paler and unmarked.

♀ dull red, fore wings with an outer band; hind wings with a central band and a faint indication of an outer band.

Expanse of wings, ♂ $2\frac{2}{10}$ inches, ♀ $4\frac{2}{10}$ inches.

125. Messata castanoptera.

♂. *Messata castanoptera*, Moore, Trans. Ent. Soc. 1884, p. 372.

Poona, September and October; Belgaum, September.

The female is of a deep pinkish-brown colour, fore wings with one postmedial line; hind wings with one medial line and in some specimens a faint indication of postmedial line. It is a common insect in Poona.

Expanse of wings $2\frac{6}{10}$ inches.

126. Sangatissa citrinula.

Dreata citrinula, Walker, xxxii. p. 376.

Sattara.

127. Nisaga simplex.

Nisaga simplex, Walker, iv. p. 885.

Sattara, June.

The female in this genus only differs from the male in having very slightly narrower fore wings, and antennæ perhaps a little less deeply pectinated; but the difference, if any, is very little.

128. Nisaga modesta.

Nisaga modesta, Moore, Trans. Ent. Soc. 1884, p. 373.

Bombay, August; Sattara, June; Poona, April.

Both the above appear in great quantities at a time.

129. Trabala vishnu.

♀. *Gastropacha vishnu,* Lefebvre, Zool. Journ. iii. p. 207 (1827).

♂. *Amydona prasina,* Walker, vi. p. 1417.

Bombay, March and August.

130. Lenodora vittata.

Lasiocampa vittata, Walker, vi. p. 1440.

Poona, November.

131. Taragama ganesa.

♂. *Bombyx ganesa,* Lefebvre, Zool. Journ. iii. p. 211 (1827).

♀. *Bombyx siva, l. c.* p. 210.

Poona, July, November, and December.

Larvæ feed on *Acacia arabica,* $3\frac{1}{4}$ inches in length, very hairy, with down quite close to the skin; colour grey; night-feeders, hide during the day in crevices in the bark of the tree; larval stage 50 to 56 days; spins on the twig of some low bush near the foot of its food-tree or on a neighbouring wall, apparently never in the tree itself; pupal stage 21 to 24 days.

132. Trisula variegata. (Plate XXI. fig. 7, pupa.)

Trisula variegata, Moore, Cat. Lep. Mus. E. I. C. ii. p. 420, pl. xii *a.* f. 1.

Poona, October; Bombay, October to December.

Two fully-grown larvæ were reared by me on the castor-oil plant; left off eating on the 4th October, 1883; one turned pupa on the 25th of the following month, and the imago emerged on the 22nd December, 1883; the other caterpillar hybernated and lost all its hairs after spinning a delicate slight cocoon; in this state I brought the insect home from Bombay, looking at it once a fortnight, for which purpose I cut off one end of the cocoon, and kept it covered with cotton; and though rather shrivelled, it was quite lively, and in this state the larva remained until last September, when it turned into a healthy chrysalis, which is still alive in my possession; it will thus be seen that this larva actually remained alive and healthy for eleven months without food, before becoming a chrysalis.

133. Lebeda buddha.

♂. *Bombyx buddha,* Lefebvre, Zool. Journ. iii. p. 209 (1827).
♀. *Bombyx brahma, l. c.* p. 208.
Bombay, July.

134. Estigena nandina.

Estigena nandina, Moore, Cat. Lep. Mus. E. I. C. ii. p. 427.
Bombay, November.

Drepanulidæ.

135. Argyris extrusata.

Ephyra extrusata, Walker, xxii. p. 637.
Poona, July and October; Bombay, November.

Saturniidæ.

136. Actias selene.

Actias selene, Macleay, Zool. Misc. ii. pl. 70.
Belgaum.

137. Attacus atlas.

Phalæna bombyx Attacus atlas, Linn. Syst. Nat. 808, 1.
Belgaum, October.

138. Antheræa nebulosa.

Antheræa nebulosa, Hutton, Journ. As. Soc. Bengal, 1869, p. 16.
Poona, September; Bombay, July to November.

139. Antheræa olivacea.

Antheræa olivacea, Moore, Monograph Saturnidæ, MS
Poona; Sattara.

Cossidæ.

140. Brachylia acronyctoides.

Brachylia acronyctoides, Moore, P. Z. S. 1879, p. 411, pl. 34. fig. 4.
Bombay.

141. ARBELA TETRAONIS.

Arbela tetraonis, Moore, P. Z. S. 1879, p. 411, pl. 34. fig. 3.

Poona, May and July.

Although Mr. Moore has described the male, he has figured a female; the abdomen of the male is thin, not more than $1\frac{4}{10}$ in diameter, being about half the diameter of the female; it has a long anal tuft, more than half the length of the abdomen, and the length of the antennæ of both sexes is proportionally equal, being more than half the length of the abdomen.

Expanse of wings, ♂ $1\frac{4}{10}$ inch, ♀ 2 inches, as represented in the Plate, which is an excellent representation of the female except for the short antennæ. It is not an uncommon insect in Poona.

HEPIALIDÆ.

142. PHASSUS SALSETTENSIS.

Phassus salsettensis, Moore, P. Z. S. 1879, p. 412, pl. 34. fig. 5.

Poona, July.

EXPLANATION OF THE PLATES.

PLATE XX.

Fig. 1. *Eressa musa*, p. 290.
2. *Corma ernestina*, ♂, p. 302.
3. *Spilosoma mona*, ♂, p. 295.
4. —— ——, ♀.
5. *Aloa flora*, p. 296.
6. *Rœselia pascua*, p. 293.
7. *Debos iratus*, p. 291.
8. *Olene fusiformis*, ♂, p. 297.

Fig. 9. *Aroa clara*, ♂, p. 299.
10. —— ——, ♀.
11. *Brunia chota*, p. 293.
12. *Arsacia frontirufa*, p. 301.
13. *Aroa sagrara*, ♂, p. 299.
14. *Olene olearia*, ♂, p. 297.
15. —— ——, ♀.

PLATE XXI.

Fig. 1, 1 *a*. *Thiacides postica*, larva and pupa, p. 302.
2. —— ——, ♀.
3. *Enome detersa*, ♂, p. 300.
4. —— ——, ♀.
5. *Messata translata*, ♂, p. 304.
6. *Phalera bobi*, p. 302.
7. *Trisula variegata*, pupa, p. 305.
8. *Gynæphora xerampelina*, ♂, p. 299.
9. —— ——, ♀.

6. On the Anatomical Differences in the three Species of *Rhea*. By HANS GADOW, Ph.D., M.A. Cambridge.

[Received March 17, 1885.]

In the spring of 1883 the Museum of the University of Cambridge received from the Zoological Society of London two specimens of *Rhea darwini* and one of *Rh. macrorhyncha*, with the understanding that I should compare examples of the three species of *Rhea* hitherto known with each other, and point out their anatomical differences, provided there were any. The comparison made in the following pages must, however, necessarily be incomplete, because some of the specimens were imperfect and were of different ages and sexes. The material at my disposal was the following:—

One specimen of *Rh. macrorhyncha*, immature, with most of the viscera removed previously.

One specimen of *Rh. darwini*, ♂, not quite adult; skeleton and viscera complete.

One specimen of *Rh. darwini*, ♀; skeleton complete, viscera partly removed previously.

Rh. americana. Several skeletons and preparations of visceral parts in the collections of the Universities of Cambridge and Heidelberg, and in the Museum of the Royal College of Surgeons of England.

Literature.

SCLATER, P. L. On the Rheas in the Society's Menagerie, with Remarks on the known Species of Struthious Birds. P. Z. S. 1860, p. 207.

——. On the Struthious Birds living in the Society's Menagerie. Trans. Zool. Soc. iv. p. 353, pls. 68–70 (1860).

BÖCKING, A. Monographie des Nandu oder Südamericanischen Strausses (*Rhea americana*). Arch. f. Naturgesch. 1863, p. 213.

The same under the title of:—De Rhea Americana: Dissertatio Zoologica. Bonnæ.

CUNNINGHAM, R. O. Notes on some Points in the Osteology of *Rhea americana* and *Rhea darwini*. P. Z. S. 1871, p. 105, pls. vi. and vi. *a*.

MIVART, ST. GEORGE. On the Axial Skeleton of the Struthionidæ. Trans. Zool. Soc. x. p. 1 (1877).

MOSENTHAL, J. DE, and HARTING, J. E. Ostriches and Ostrich Farming. 8vo. London, 1877.

SCLATER, P. L. Note on *R. macrorhyncha*. P. Z. S. 1877, p. 160.

GADOW, H. Versuch einer vergleichenden Anatomie des Verdauungs-Systemes der Vögel. Jenaische Zeitschrift, xiii. pp. 92, 339 (1878).

FORBES, W. A. Eleven weeks in North-eastern Brazil. Ibis, 1881, p. 312.

——. On the Conformation of the Thoracic End of the Trachea in the "Ratite" Birds. P. Z. S. 1881, p. 778.

Skeleton.

Comparison of the skulls *in toto* (see pp. 310, 311) shows at a glance that the long-billed feature of *Rh. macrorhyncha* is less due to a larger or stronger bill than to the narrower, more slender shape of the whole skull. In order to explain this, the following measurements have been taken :—

ad. The length of the mandible from the hindermost upper angle of the os angulare to the tip of the os dentale.

oe. Direct distance between the middle of the occipital region (on the outer surface of the skull) to the anterior end of the ethmoidal region, at the point *.

ep. Distance from * to the tip of the os premaxillare.

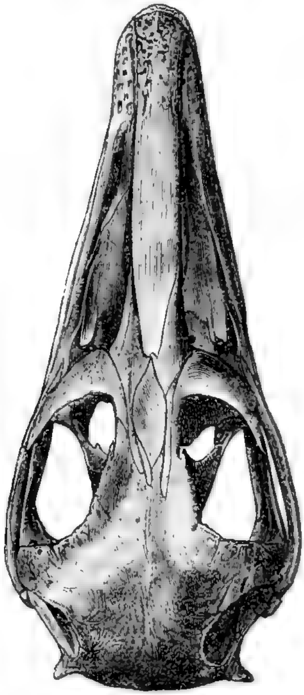
jug. Greatest outer distance between the two jugal arches.

	oe.	*ep.*	*ad.*	*jug.*
	mm.	mm.	mm.	mm.
Rhea americana......	89	91	162	75
—— *macrorhyncha* .	76	76	140	55
—— *darwini*, ♀	80	71	135	

This table shows that the distance *ep* (corresponding fairly with the length of the bill) in *Rh. macrorhyncha* equals that of *oe*, whilst in *Rh. americana* it is rather longer, and in *Rh. darwini* considerably shorter. The latter species has therefore the proportionately shortest, *Rh. americana* the longest "bill." However, the name of *Rh. macrorhyncha* is less unjustifiable if we consider the width between the two jugular arches at the point of their greatest distance, the latter being 75 millim. in *Rh. americana*, and only 55 millim. in *Rh. macrorhyncha* ; whilst in proportion to the total length of the skull, it should measure 65, or in proportion to the distance *ep* 63, instead of 55 millim. Owing to this formation the skull of *Rh. macrorhyncha* has a much more slender appearance.

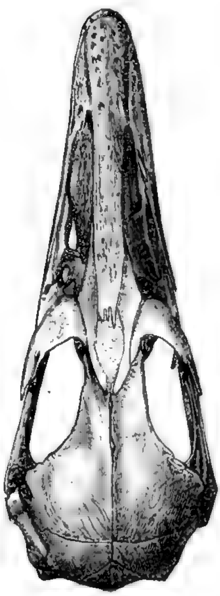
According to Cunningham, the lachrymal bones constitute an important distinctive character between the Common and Darwin's Rhea. In his specimen of the Common Rhea, the descending anterior orbital process of the lachrymal bones was deeply notched, whilst in *Rh. darwini* this notch was converted into a large foramen by another bar of bone, for the reception of one of the orbito-nasal air-sacs. I found, however, this foramen besides in the two specimens of *Rh. darwini*, likewise in the adult *Rh. americana*, but a deep lateral notch (like that figured by Cunningham, P. Z. S. 1871, pl. vi. fig. 1) in *Rh. macrorhyncha*. The Cambridge specimens of *Rh.*

Fig. 1.



Skull of *Rh. americana*, $\frac{2}{5}$ natural size. Upper surface.

Fig. 2. Fig. 3.



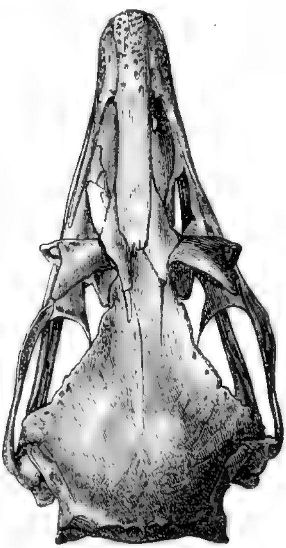
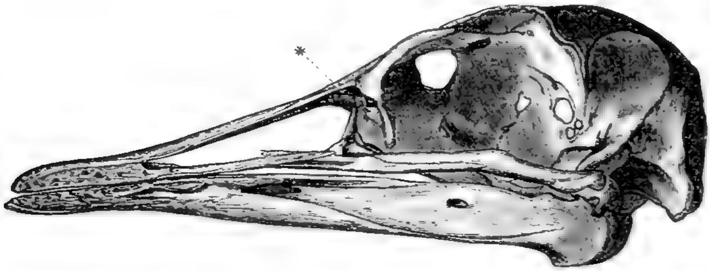


Fig. 2. Skull of *Rh. macrorhyncha*, $\frac{2}{5}$ natural size. Upper surface.
Fig. 3. Skull of *Rh. darwini*, $\frac{2}{5}$ natural size. Upper surface.

americana possessing this foramen reduce its presence or absence to an unimportant individual variation.

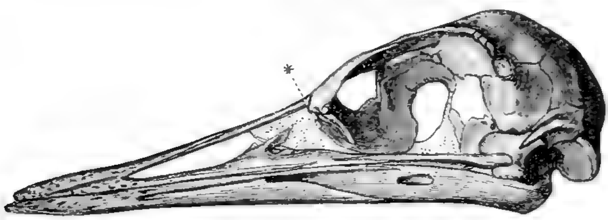
Regarding the vertebral column, the three species exhibit some

Fig. 4.



Skull of *Rh. americana*, $\frac{2}{5}$ natural size. Side view.

Fig. 5.



Skull of *Rh. macrorhyncha*, $\frac{2}{5}$ natural size. Side view.

Fig. 6.

Skull of *Rh. darwini*, $\frac{2}{5}$ natural size. Side view.

highly interesting differences, which would be of great importance if we could be certain that they are not due to individual variation.

The differences are shown in the following tabular arrangement :—

Serial number of vertebræ.	*Rh. americana.*	*Rh. darwini.* ♀. | ♂.	*Rh. macrorhyncha.*
15......	Last cervical or transitional rib.	Last cervical or transitional rib.	
16......	Free rib	Free rib	Last cervical or trans. rib.
17......	1st sternal rib[1] ...	Free rib	Free rib.
18......	2nd ,, ...	1st sternal rib	Free rib.
19......	3rd ,, ...	2nd sternal rib	1st sternal.
20......	4th ,, ...	3rd sternal rib	2nd sternal.
21......	1st lumbar	1st lumbar	3rd sternal.
22......	2nd ,, ...	2nd lumbar	1st lumbar.
23......	3rd lumbar, ankylosed with ilium.	3rd lumbar, ankylosed.	2nd lumbar.
24......	......	......	3rd lumbar.
25.			
26...... 27......	Acetabular process	Acetabular processes ...	Acetabular.
28......	......	......	
29...... 30...... 31...... 32......	No transverse processes connecting the ilium with the vertebral column.		No transverse processes.
33...... 34......	The two primitive sacral vertebræ.		
35.			
36......	Last connection with ilium.		
37......	......	Last connection with ilium.	

The postsacral region, beginning with the 37th or 38th vertebra respectively, shows in all the specimens the almost complete resorption of the vertebral column which is typical and so remarkable of the genus *Rhea*. In *Rh. americana* and in *Rh. darwini* the first 14 cervical vertebræ possess, with the usual exception of the atlas and epistropheus, the typical avian cervical ribs, which ankylose firmly with the dorsal and ventral lateral processes of their vertebræ; their distal sharply-pointed ends are directed parallel to the long axis of the vertebral column. The 15th vertebra carries a short (about 2–3 centim. long), thick and blunt, not moveable, rib. We will call this rib the *intermediate* or transitional one, because it forms the transition from the cervical to the thoracic ribs, or it may also be called pseudo-cervical. Then follow 8 long ribs, of which in our two specimens of *Rh. darwini*, in Dr. Cunningham's *Rh. darwini* and *Rh. americana*, and in Prof. Mivart's *Rh. americana*, the first two do not reach the sternum, wanting the sternal connecting

[1] Cunningham says that in the two specimens of *Rh. americana* and *Rh. darwini* examined by him but three ribs (the third, fourth, and fifth) were connected with the sternum. The same is the case with the specimen of *Rh. americana* in the Royal College of Surgeons examined by Prof. Mivart. The Heidelberg and the Cambridge specimens of *Rh. americana* possess four pairs of sternal ribs, each of which is furnished with an uncinate process. The number of sternal ribs is therefore subject to individual variation. About four or five of the neck-vertebræ were wanting in Cunningham's specimen of *Rh. darwini.*

portion. These ribs are therefore anterior pseudo-thoracic. The last three ribs of the whole number of eight are in all Rheas likewise not connected with the sternum—true lumbar or posterior pseudo-thoracic ribs. The skeletons of the American Rhea in the Cambridge and Heidelberg Museums have each four pairs of true sternal ribs, each being furnished with an uncinate process.

Rh. macrorhyncha varies from the other two species in having 15 true cervical vertebræ, the 16th of the series bearing the transitional rib, whereupon follow two long pseudo-thoracic, then three true sternal, and lastly three lumbar ribs. The 23rd vertebra (in *Rhea darwini* and *americana*), but the 24th in *Rh. macrorhyncha*, is the first which is firmly ankylosed with the ilium and with the following vertebra. The same happens, however, to the next one in front in most old specimens.

The acetabular connection of the ilium with the vertebral column is effected by the 26th and, chiefly, the 27th vertebra, but in *Rh. macrorhyncha* by the 27th and 28th.

The true primitive sacral vertebræ, as determined by Gegenbaur for the avian pelvis, are in all specimens the 33rd and 34th.

In the male specimen of *Rh. darwini* the 34th nerve received no connecting branch from the 33rd, the latter therefore belonging entirely to the ischiadic plexus, just like the 34th in *Rh. macrorhyncha*. At any rate the ischiadic plexus is in all the specimens of Rhea examined by myself composed of six postacetabular spinal nerves.

Considering these facts, we conclude that the 34th vertebra is serially homologous in all the specimens as being the second primitive sacral vertebra, and it can in our comparison be looked upon as the starting point or zero, but that the whole ischiadic and crural plexuses of *Rh. macrorhyncha* are placed *one* metamere further tailwards than the corresponding portions in *Rh. darwini* and *Rh. americana*. Moreover, since the portion from the transitional vertebra to the last rib-bearing vertebra is homodynamous in all the three species (although falling under the category of parhomology or imitatory homology of Fuerbringer), we conclude rightly that *Rh. macrorhyncha* possesses one true cervical vertebra more than the other two species. This excess in number is compensated by the shortening of the number of presacral pelvic vertebræ from 6 to 5.

The number of vertebræ constituting the various regions is therefore:—

	R. darwini.	*R. americana.*	*R. macrorhyncha.*
Atlas to transitional vertebra ..	15	15	16
Vertebræ with long ribs	8	8	8
Preacetabular vertebræ without ribs	3	3	3
Number of vertebræ from acetabular to first primitive vertebra (the latter included) ..	7	7	6
	33	33	33

Makes 33 vertebræ between the occiput and the primitive intersacral nerve, which in all the three species is the 34th spinal nerve, no matter whether being at the same time the last ischiadic root, without connection with the pubic plexus as in *Rh. macrorhyncha*, or being in connection with the ischiadic plexus by a ramus communicating only and belonging chiefly to the pubic region, as in *Rh. darwini* ♀.

We have therefore to compare the series of the first 15 vertebræ of *Rh. macrorhyncha* with the first 14 vertebræ of the other two species. There can be no doubt now, that the greater number of neck-vertebræ is not produced simply by a shortening of the first pseudo-thoracic rib, as it generally happens in apparently similar cases of variation in the number of ribs, but, on the contrary, that the whole of the thoracico-lumbar region has been affected by a tailward "shifting" to the extent of one metamere; and it is also absolutely certain that the serial differences between *Rh. americana* and *Rh. macrorhyncha* have not been brought about by the inter- or ex-calation of a vertebra.

In order to determine whether *Rh. macrorhyncha* possesses a proportionately longer neck than the other species, we have to compare the length of the neck to some distance which must stand in some reasonably conceivable correlation to the former. The distance between the neck and the acetabular region appears to be rather advisable for this purpose. Again, one may fairly well suppose that in essentially terrestrial birds there might be a correlation between the length of the neck and the length of the hind limbs. However, the elevation of the trunk above the ground depends not only upon the length of the hind limbs, but also upon the angles formed by various segments of the limb to each other and to the pelvis. These considerations therefore leave the following results open to doubt. At any rate I have made the calculations, in which a certain limit of error in measuring the neck and limb must be allowed.

	R. darwini ♀. centim.	*R. americana.* centim.	*R. macrorhyncha.* centim.
Length of neck from atlas to cephalic end of transitional (14th or 15th) vertebra..	52·7	57·0	47·5
Length of femur + tibia + tarso-metatarsus........	88·3	87·4	73·1

If the neck of *Rh. darwini* were of the same proportionate size as that of *Rh. macrorhyncha*, there ought to be

$$52{\cdot}7 : 88{\cdot}3 = 47{\cdot}5 : 73{\cdot}1$$

but

$$52{\cdot}7 \times 73{\cdot}1 = 3852{\cdot}37$$
$$88{\cdot}3 \times 47{\cdot}5 = 4194{\cdot}25$$

Since we want to know the proportion of the neck, we must leave the limbs unaltered, but shall have to increase the index for the *neck* of *Rh. darwini* in order to render the proportions of the equation correct. This would be the case if the neck of *Rh. darwini* were about 57·3 centim. long instead of 52·7. Consequently the neck of *Rh. macrorhyncha* is proportionately longer than that of *Rh. darwini*.

Again, the corresponding figures for *Rh. americana* and *Rh. macrorhyncha* are 4151 and 4191, sufficiently agreeing (considering errors of measurement) to show that the proportionate length of the necks of these two species is the same. *Rh. americana* compensates the shortness of its neck, caused by the smaller number of neck-vertebræ, by the shortness of its hind limbs.

As we come to the conclusion that *Rh. americana* has the shortest hind limbs (p. 316) we can look upon these calculations as checking each other's correctness. Whether compensation be effected also by a greater length of the single cervical vertebræ, it would be very difficult to find out.

Lastly the corresponding figures for *Rh. americana* and *Rh. darwini* are 5033 and 4606, again showing that we should have to increase the index for the neck of *Rh. darwini* to about 57·5 in order to get a correct equation. This proves beyond doubt that *Rh. darwini* has the proportionately shortest neck of the three species, and the more so because it possesses the largest hind limbs.

The length of the neck, expressed in per cent. of the whole vertebral column from the axis to the acetabular vertebra, is *Rh. darwini* 59, *Rh. macrorhyncha* 61·68, and *Rh. americana* 61·95.

It was interesting to find out whether there existed a correlation between the limbs and the neck and trunk. The following measurements show, first, that *Rh. americana* and *Rh. macrorhyncha* agree almost absolutely with each other in the proportions of their limbs to the acetabular-atlas distance; secondly, that there exists a correlation between the distances applied, unless we attribute to mere coincidence the fact that the same results are arrived at by different calculations.

	R. darwini.	*R. macrorhyncha.*	*R. americana.*
	centim.	centim.	centim.
Length of femur + tibia + metatarsus..............	88·3	73·1	87·4
Length from atlas to acetabulum	88·7	77·0	92·0

$$73{\cdot}1 \times 92 = 6725{\cdot}2$$
$$87{\cdot}4 \times 77 = 6729{\cdot}8$$

Measurements of the Limbs.

Length of	*R. americana.*	*R. macrorhyncha.*	*R. darwini* ♀.	*R. darwini* ♂.
Humerus	291	240	269	252
Ulna	216	166	188	174
Hand	119	93	116	108
2nd metacarpal	86	77	78	73
Whole wing	626	499	573	534
Femur	220	190	220	214
Tibia	330	271	330	308
Tarso-metatarsus	324	270	333	289
3rd toe	103	94	116	123
Whole hind limb	977	825	999	934
Pelvis, præantitrochant.	131	101	128	121
Pelvis, postantitrochant.	185	120	179	149
Pelvis, total length	316	221	307	270
Pelvis, from spina pubica to end of ischium	264	204	258	232

A. =100.	B. in per cent. of A.	*R. americana.*	*R. macrorhyncha.*	*R. darwini* ♀.	*R. darwini* ♂.
Humerus.	Ulna	74·4	69·1	69·8	69·0
Humerus.	Hand	40·9	38·7	43·1	42·8
Whole wing.	Hand	19·0	18·8	20·2	20·2
Whole hind limb.	Whole wing	64·1	60·5	57·3	57·2
Tarso-metatarsus	3rd toe	31·8	34·5	34·8	42·5
Whole length of pelvis.	Femur	69·6	85·9	71·9	79·2
Postantitroch. length of pelvis.	Præantitroch. pelvis	70·8	84·1	71·5	81·2

The conclusions which might be drawn from the above tables are few, and even these are not very reliable because of the different age of the specimens examined, as is apparent from the various discrepancies between the two specimens of *Rh. darwini*. With regard to the hand, *Rh. darwini* possesses the longest, *Rh. americana* the shorter, *Rh. macrorhyncha* the shortest hand; and if we combine this result with the fact of *Rh. americana* having the longest humerus in proportion to the other two species, we may fairly conclude that the wing is least rudimentary in *Rh. darwini*, in spite of its whole wing being surpassed in length by that of *Rh. americana* by about 50 millim. But of course we must bear in mind that the reduction begins at the distal end.

Again, *Rh. darwini* possesses the longest, *Rh. americana* the shortest hind limb in proportion; the weakness of the wings of the other species is therefore not compensated by a stronger development of the hinder extremities.

Concerning the toes, *Rh. macrorhyncha* agrees with the female specimen of *Rh. darwini*, both having longer toes than *Rh. americana*, whilst the male specimen of *Rh. darwini*, although not quite adult, is remarkable for the still greater length of its toes. The proportional shortness of the toes of the Common Rhea has already been observed by Mr. Cunningham. Mr. Sclater's original statement that the toes are much shorter in his *Rh. macrorhyncha* than in the Common Rhea cannot be confirmed.

The proportions of the femur and tarso-metatarsus to each other permit of no safe conclusions, nor do the dimensions of the pelvis, owing to the considerable alterations undergone by these parts during the individual growth.

The scapula of *Rh. americana* seems to be much longer than that of *Rh. darwini*, in comparison with the coracoid, although the latter bone in Darwin's Rhea is absolutely stronger. This apparent shortness of the scapula, however, is partly produced by this bone being curved at a sharper angle in *Rh. darwini*.

Muscles.

The examination of the muscles of two *Rh. americana*, two *Rh. darwini*, and one *Rh. macrorhyncha* did not yield many interesting variations except for that most variable of all the thigh-muscles, to wit the famous m. ambiens.

In the Common Rhea this muscle was typically developed, arising from the pubic spine, and its slender tendon passing the knee to form one of the heads of m. flexor perforatus. In *Rh. macrorhyncha* the muscle arose from the latero-dorsal aspect of the pubic spine and at the same time from the big crural vein, the muscular and aponeurotic fibres of the muscle having firmly got hold of the ventral aspect of this vein. The right and left side were alike; the tendon of the muscle passed the knee in the typical way.

Rhea darwini, ♀.—The m. ambiens of either side arose from the pubic spine as usual, but its tendon, before reaching the knee, became flattened out and attached itself with a broad fan-shaped and very thin aponeurosis to the patella, in a similar style as the median additional portion of the m. femoro-tibialis (m. vastus).

Rh. darwini, ♂, left thigh. The m. ambiens stopped at the knee as in *Rh. darwini* ♀.

Right thigh.—Muscle typically developed and passing the knee with a strong and independent tendon.

This abnormal condition of the m. ambiens, which seems to be prevailing in Darwin's Rhea, is the intermediate stage between a typically developed m. ambiens and such forms in which, as in *Casuarius*, this muscle has lost still more of its independence, and then only forms an additional head of the median part of the portio media m. femori-tibialis s. vasti.—Without an elaborate examination and comparison of the formation of these muscles with their nerve-supply, we should with Garrod come to the conclusion that *Casuarius* did not possess an ambiens muscle. The assumption of still further reduction of the distal portion of the m. ambiens explains what I have observed in some Passerine birds, *e.g.* in a specimen of *Lanius bentet*, in which the m. femoro-tibialis internus, besides being strongly developed, received in its proximal part a thin spindle-shaped semitendinous head from the pubic spine. This additional little slip is probably the last trace of the ambiens muscle, whch is now generally lost by the Passerine birds.

The case above described is one way in which this muscle gets lost; in other cases, *e. g. Ciconia* and *Phœnicopterus,* the reduction does not begin by its tendon becoming attached to neighbouring tendons in the knee-region, but the whole muscle shows a diminution of its tendon and belly to a mere thread, till at last this also disappears, *e. g.* in *Abdimia* and *Xenorhynchus.*

Digestive Organs.

The digestive organs of *Rhea darwini* did not present any remarkable differences from those of *Rh. americana,* and a comparison of the relative dimensions was not advisable because of the different age of the specimens examined.

The hepatic and pancreatic ducts, together with the shape of the

Fig. 7.

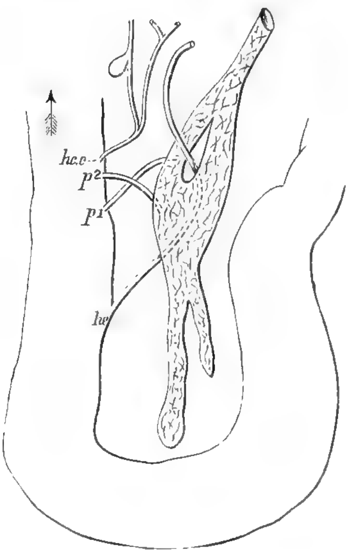


Fig. 8.

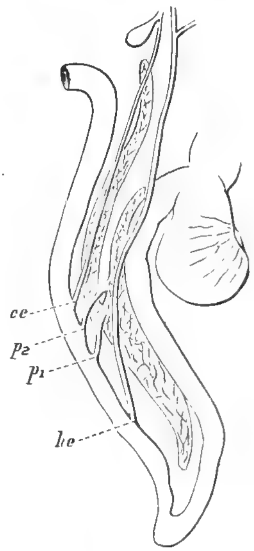


Fig. 7. *Rh. americana.* The duodenal loop and pancreas, with the first and second pancreatic ducts (p_1 and p_2), and showing the hepato-enteric duct (*he*), the cystico-enteric (*ce*), and the hepato-cystico-enteric duct (*hce*).

Fig. 8. *Rh. darwini,* ♀. The duodenal loop is represented too wide in this figure.

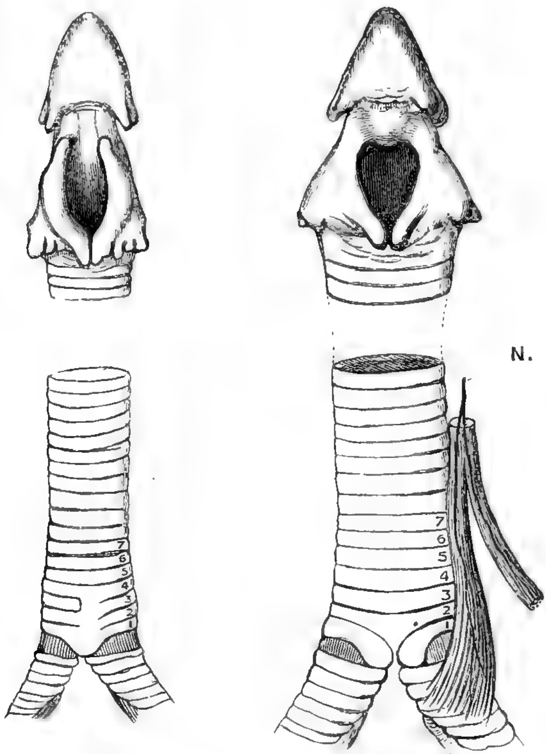
pancreas of *Rhea darwini* ♂, showed an arrangement somewhat different from that of the *Rhea americana* described by myself in the 'Jenaische Zeitschrift.' See figures 7 & 8.

Respiratory Organs.

There are some differences in the shape of the posterior margin of the upper larynx, as will be seen in the following wooducts:—

The number of tracheal rings in *Rh. macrorhyncha* is 185, in *Rh. darwini* 152; and the rings themselves are comparatively broader and thicker in the latter species, thus making up for their considerably smaller number, as the length of the whole trachea does not show any important differences in the two species. The syringeal muscle described by Forbes exists in all the specimens dissected by me; however, in level of the 9–11th last tracheal rings, the upper end of the tracheo-bronchial muscle passes into the lower end of the

Fig. 9. Fig. 10.



Rh. macrorhyncha. *Rh. darwini.*

Dorsal view of tongue, larynx, and syrinx. N, branch of hypoglossal nerve.

long m. cerato-trachealis, which runs down from the cerato-hyal along the side of the trachea. Both these muscles and the m. tracheo-sternalis are supplied by branches of the descending ramus of the hypoglossal nerve, thus leaving no doubt as to their common origin from muscles of the hyoid arches.

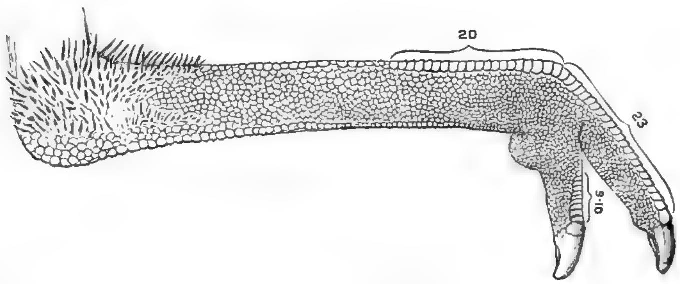
In all other respects the syrinx of my specimens of *Rhea darwini* and *R. macrorhyncha* agrees with the description given by Forbes. The slight modifications concerning the partial fusion of the last tracheal rings are easily explained by differences of age and individual variation. The same, I am sorry to say, applies to the vascular and genital systems.

Tegumentary System.

Concerning the coloration of the plumage, *Rh. macrorhyncha* is said to be distinguishable from *Rh. americana* "by its generally browner colouring, and by the darker crown, which is nearly black" (Forbes). *Rh. darwini* is characterized by its white-tipped feathers. How far these differences are subject to individual variation, and to age, is not yet satisfactorily known, owing to the scarcity of adult specimens of *Rh. macrorhyncha.*

One decidedly good distinguishing character is given by the scales and the scutellation of the metatarsus. In *Rh. darwini* the distal half of the front side of the metatarsus is covered by broad transverse scutes, numbering about 20; whilst on the proximal half, the sides, and the hinder aspect of this portion of the foot the featherless integument is reticulated. The multangular reticulate little scutes are thickest and largest on the "heel," and are gradually decreasing in size towards the toes. The anterior dorsal surface of the toes is protected as follows:—The middle (3rd) toe is covered by 23 transverse broad scutes, which form the direct continuation of those of the metatarsus. The inner (2nd) toe possesses only about 9–10, the outer (4th) toe about 12 such scutes; these are biggest near the claws or nails, and gradually change into the reticulated structure which covers the first phalanx of the inner and outer toes.

Fig. 11.



Median view of the left foot of *Rh. darwini,* diagrammatic. The outer or fourth toe is not shown.

In *Rh. americana* and *Rh. macrorhyncha* the front of the metatarsus is covered with broad transverse scutes throughout its length, like the dorsal sides of the toes. *Rh. darwini* represents in this respect, like *Dromæus* and *Casuarius,* a lower stage than either *Struthio* or the other *Rheas,* since for obvious reasons the formation of broad scutes began distally, at the toes, and worked its way proximally upwards.

Geographical Distribution.

The geographical distribution of the three species of *Rhea* known at present seems to be the following:—

Rh. americana ranges from Bolivia and the Province of Mattogrosso

(Villa Bella and Cuyabá) through Paraguay across the Paraná into Uruguay. Its headquarters appear to be the pampas of Argentina, whence it extends southwards to the Rio Negro of Patagonia.

Rh. darwini seems to be restricted to the eastern half of Patagonia and to South-eastern Argentina; about the Rio Negro of Patagonia both species occur together.

Rh. macrorhyncha has been found in the Provinces of Pernambuco and Bahia. Its north-westward and westward range is probably limited not by the Amazons and its enormous tributaries, but by the broad thick belt of forest of the Amazonian subregion. Its occurrence in Guiana is therefore improbable. As *Rh. americana* does not seem to occur in the South-eastern provinces of Brazil, "probably the barrier between the two species is a continuously wooded country [and I should add the numerous low but rough mountain-ranges] between that district and the Sertões de Bahia" (Forbes).

Summary.

The chief differences between the three species are the following:—

	Rhea americana.	*Rh. macrorhyncha.*	*Rh. darwini.*
Number of cervical vertebræ	15	16	15.
Neck	long	long	short.
Hand	shorter	shortest	longest.
Hind limb	shorter	shorter	longer.
Toes..................	shortest	longer	longest.
Bill	longest bill	longest bill	shortest bill.
Skull	broad	narrow	broad.
Metatarsus	with transverse scutes through its length.	with transverse scutes through its length.	scutes on distal half only.
Ambiens muscle...	typically developed	typically developed	apparently subject to frequent modifications.
Tracheal rings ...	....	greatest number	smallest number.
General coloration of plumage	....	generally darker than *Rh. americana*, especially on the head.	most of the feathers with white tips.
Habitat	Southern half of South America.	North-eastern Brazil.	South-eastern South America.

This tabular arrangement shows that Darwin's Rhea differs considerably from the other two species, whilst the latter offer apparently few important characters for separation. However, no matter if the number of the neck-vertebræ of *Rh. macrorhyncha* (the best name for which would be that of the *long-necked* or *slender-headed* Rhea) be a constant character or not, the differences in the proportions of the skulls afford an anatomical character just as good as those which induce us to consider *Rh. darwini* a so-called good species. If we thus consider the three forms of Rhea as three equivalent species, their present geographical distribution becomes less puzzling; otherwise we should expect *à priori* that the eastern form would differ more from the two others than these do from each other. Moreover, since it rarely happens that two large species of a certain order or family of creatures inhabit the same tracts of country unless they do so through immigration, it is probable that the original home of *Rh. americana* was Central South America, and that it spread from there into regions occupied by *Rh. darwini*.

April 21, 1885.

Prof. Flower, LL.D., V.P.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of March 1885:—

The total number of registered additions to the Society's Menagerie during the month of March was 94, of which 3 were by birth, 35 by presentation, 35 by purchase, 4 were received on deposit, and 17 by exchange. The total number of departures during the same period, by death and removals, was 114.

The most noticeable additions during the month of March were as follows:—

1. A female Roan Kangaroo (*Macropus erubescens*)[1], being the third specimen of this Kangaroo acquired by the Society, and the first of the female sex. During the present month we have, singularly enough, acquired a second female specimen of the same animal, along with other Kangaroos, in exchange from the Zoological and Acclimatization Society of Victoria, Melbourne.

2. Six Wattled Starlings (*Dilophus carunculatus*) from South Africa, purchased March 20th and 27th. These are the first examples we have received of this curious Starling, which is remarkable for the extreme development of the wattles in the adult male. We have specimens believed to be of both sexes, but all are in immature dress at present.

3. Two Cape Colies (*Colius capensis*), purchased March 20th. These are the first examples of this Coly yet received; they have been placed in the Parrot House along with the specimens of two other species of the same genus recently acquired, viz. *C. erythromelon* and *C. nigricollis*.

Mr. Sclater exhibited specimens of a pair of Pheasants from Bala Murghab, Northern Afghanistan, belonging to H.R.H. the Prince of Wales. Mr. Sclater was inclined to refer this bird to *Ph. insignis*, Elliot (P. Z. S. 1870, p. 404, and Mon. Ph. vol. ii. pl. 3), of which the true locality (unknown to Mr. Elliot) was thus established. Mr. Elliot's skins were without heads, but Mr. Elliot had correctly

[1] Cf. P. Z. S. 1870, p. 216, pl. x., and p. 368; P. Z. S. 1871, p. 240.

J. G. Keulemans lith. Hanhart imp.

PHASIANUS PRINCIPALIS, ♂

guessed that there was no white ring present. He had not, however, quite correctly restored the colours of the head, which more nearly resembles that of *Ph. colchicus*, as would be seen by the figure (Plate XXII.). Mr. Sclater read the following extracts from a letter addressed by Mr. Condie Stephen to Lt.-Gen. Sir Dighton Probyn (dated Bala Murghab, Jan. 9th, 1885) relating to these specimens :—

"During my visit to Sandringham last winter, I alluded in conversation to the Pheasants which I had seen on my last journey in these regions, mentioning the richness of their plumage and their peculiarly white wings; and the Prince of Wales did me the honour of inquiring whether there was any possibility of conveying live specimens to England.

"Owing to the difficulties of communication and the great distance, I find it would be impossible to send any live ones home. But as the Prince of Wales was so good as to take an interest in the matter, I venture to send by messenger leaving for London to-morrow, preserved specimens of a cock and hen for submission to His Royal Highness. Dr. Aitchison, the naturalist accompanying the Afghan Frontier Commission, states that these Pheasants are *sui generis*, and that the colouring of the cock bird is peculiarly varied. They abound in the reeds fringing this river, rising in places in far larger numbers than I have seen at any battue in England. You can imagine what a quantity there must be from the fact that we killed more than 400 on our march of 30 miles up the river, mostly cocks.

"P.S. (May 7th, 1885).—Since I exhibited the Pheasants above mentioned I have an opportunity, through Mr. Seebohm's kindness, of comparing them with the fine series of specimens of Asiatic *Phasiani* in his collection, and have been obliged to modify my conclusions as to the determination of this bird. *Phasianus insignis* of Elliot, according to Mr. J. Scully, who has himself met with this form in Kashgaria, is not really different from *Phasianus shawi* of the same country, to which, indeed, the present bird has many points of resemblance.

"On comparing it, however, with one of Mr. Scully's skins of *Ph. shawi*, obtained in Yarkand in March 1875, now in Mr. Seebohm's collection, we find the upper surfaces of the two birds nearly alike, with the exception of the pronounced white wings of the present bird. On the under surface, however, the bird from Murghab is at once observed to differ in having the feathers of the sides of the belly broadly tipped with bright purplish black. These broad margins are also continued over the whole of the middle of the belly, where they assume a strong golden red colour, the centre of each feather having a more yellowish tinge. The black central patch of the belly seen in *Ph. shawi* is also hardly apparent at all in the Murghab bird.

"Another ally of the Murghab Pheasant is the *Ph. persicus* of Severtzoff, shortly described in 'The Ibis,' 1875, p. 494. Of this scarce form Mr. Seebohm has lately obtained a fine adult male specimen killed at Hadschi-Nefes, on the Attrek. In some respects the Murghab bird comes nearer to *Ph. persicus* than to *Ph. shawi*, as it presents on the lower surface the purplish black terminal edgings to the side feathers, although these are not nearly so broad as in the Murghab bird. But *Ph. persicus* differs from the Murghab species in having the lower back and outer edges of the rectrices of a fine shining coppery purple, quite different from the brownish red of the Murghab bird. Under these circumstances I do not think the latter can be referred exactly to any known species, and I therefore propose to characterize it shortly as

"PHASIANUS PRINCIPALIS, sp. nov. (Plate XXII.)

"*Capite et collo metallice viridibus: torque nullo: alis extus pro maxima parte pure albis: ventris medii plumis in centro flavescentibus, cuprescente rubro late circumdatis: ventris lateralis plumis aurescenti-rubris purpurescenti-nigro late marginatis: plaga ventris medii nigra nulla: long. tota circa* 36, *alæ* 10, *caudæ* 23, *poll. angl.*

"*Hab.* In ripis fl. Murghab, Asiæ centralis.

"*Obs.* Species crassitie majore, albedine alarum, pectore purpurescenti-rubro et plaga nigra fere omnino carente insignissima."

Mr. G. E. Dobson, F.R.S., exhibited on behalf of M. Fernand Lataste, C.M.Z.S., two skulls of the Insectivorous Mammal *Crocidura aranea* obtained by M. Lataste from the castings of birds of prey. One of these skulls presented the interesting peculiarity of possessing a supernumerary premolar on both sides of the upper jaw, as in the species of the closely allied subgenus *Pachyura*, while the other had a single supernumerary tooth on the left side. M. Lataste wished to draw particular attention to the presence of these teeth as demonstrating the artificial character of the subgenera *Pachyura* and *Crocidura*.

The Secretary exhibited an egg of Darwin's Rhea, and two small examples of eggs of a Rhea, supposed by the sender to be those of *Rh. macrorhyncha*, and read the following letter addressed to him by M. Georges Claraz on this subject:—

Avry-devant-Pont (Canton de Fribourg),
Suisse, le 16 mars, 1885.

Très honoré Monsieur,

Sous les auspices de Monsieur John Ball, qui a eu l'obligeance de me communiquer votre adresse, je consigne à la poste à votre nom une petite boîte contenant:—

1. Œuf de *Rhea darwinii*;
2. Œufs que je supposais être du *Rhea macrorhyncha*.

Pour ce qui concerne le *Rhea darwinii*, ses œufs ont toujours, quand ils sont frais, une teinte légèrement bleuâtre ou verdâtre; tandis que ceux du *Rhea americana* à l'état frais (ou extraits du ventre de l'animal) ont une teinte jaunâtre. L'exposition à l'air fait perdre cette teinte naturelle aux uns et aux autres ; ils deviennent de plus en plus blancs. La texture de l'œuf parait (à l'œil nu) présenter une différence entre l'une et l'autre espèce. Pour quant aux dimensions et à la forme la différence est guère sensible ; du reste elles sont un peu variables tant chez l'une que chez l'autre espèce.

L'époque de la ponte varie un peu selon la latitude. Dans l'Entre Rios et à Buenos Ayres le *Rhea americana* commence à pondre en août, et dès cette époque on voit sur le marché de Buenos Ayres des œufs d'Autruche. Les premiers œufs se rencontrent isolés ; plus tard alors le mâle cherche un lieu sans herbes, où la terre est nue, pour y établir le nid, qui est sans art. C'est là que les femelles pondent. Dans le sud à Bahia Blanca et Patagones le *Rhea americana* commence à pondre en octobre, rarement auparavant. La ponte dure jusqu'en décembre ; on rencontre pendant ce mois encore des œufs frais.

Pour la *Rhea americana* l'incubation dure 30–31 jours ; la température nécessaire est de 103° Fahr. Je tiens ces indications des établissements qui élèvent des Autruches.

Pour la *Rhea americana* la puberté entre dans la deuxième année, et elle pond dans la troisième. La première ponte d'une femelle ne dépasse guère 25 à 30 œufs ; elle en pond le double dans les années suivantes.

La *Rhea darwini* pond à la même époque que la *Rh. americana*. J'ai rencontré des œufs frais en octobre, novembre et décembre entre le Rio Negro et le Chubat. Elles pondent comme l'espèce précédente sur la terre. A l'époque de l'incubation, le mâle a la peau du bas du corps plus épaisse et à la poitrine cornée. On assure que le mâle qui couve gratte la terre avec le sternum tant chez l'espèce *Rh. darwini* que chez l'espèce *Rh. americana*.

Le nombre d'œufs contenu dans un nid est pour le *Rh. darwini* de 15 à 20 environ ; c'est le même chiffre pour le *Rh. americana* du moins dans le sud ; dans le nord j'ai vu une fois un nid en contenant 32. Les deux espèces nourrissent les mêmes parasites dans leurs intestins, des vers ressemblants aux *Tæniæ*, et en grand nombre. Dans le tissus sous-cutané elles ont surtout dans leur jeune âge un assez grand nombre de *Filaria*. J'en avait envoyé autrefois des exemplaires au défunt M. Claparède qui provenaient du *Rh. darwini* ; j'en ai remis des exemplaires du *Rh. americana* au Dr. Goll pour le Musée de Zurich, et à M. le Prof. Carl Vogt à Genève. Autant que j'ai pu en juger les parasites de l'une et de l'autre espèce sont identiques. Mais ce qui m'a surpris ce fut d'apprendre dans un établissement de Merlo (situé à 32 kilomètres de Buenos Ayres) où l'on élève des Autruches africaines, et aussi quelques américaines, que les premières souffrent d'un ver intestinal ressemblant au ver solitaire et aussi de filaires. Toutefois je n'ai pas vu d'exemplaires. Mais je vis lors de ma visite de jeunes Autruches africaines maigres et malades auxquelles on administrait de la fleur de soufre mêlée à du miel, et on m'a dit qu'elles avaient des filarias.

Pour quant à la troisième espèce *Rh. macrorhyncha*, je ne l'ai jamais vue. Monsieur Nouguer, le plus grand négociant de plumes d'Autruches à Buenos Ayres, m'a demandé si je connaissais une espèce qu'il croyait être un croisement entre *Rh. americana* et *Rh. darwini*, car il avait, m'assurait-il, plus d'une fois reçu des plumes qui n'appartenaient ni à l'une ni à l'autre des espèces précitées, mais qui paraissaient de couleur intermédiaire. On lui a dit que ces Autruches avaient le corps très-large. Le défunt Professeur Lorentz m'a dit que dans ses voyages on lui a plus d'une fois parlé d'une troisième espèce très sauvage et farouche, habitant les terrains montagneux, qui prend la fuite au moindre bruit et est difficile à atteindre. M Moreno m'a dit avoir vu dans le sud de la Patagonie, au pied de la Cordillère, une espèce plus petite, plus sauvage ; il en parle dans son ouvrage ('Viaje a la Patagonia austral,' p. 399). Il dit que la grosseur ne serait que les $\frac{2}{3}$ du *Rh. darwini*.

Les Indiens m'ont aussi parlé de cette troisième espèce et m'ont dit que quand on a la bonne fortune de rencontrer un nid, ce qui est assez rare, on a soin de garder les œufs "*parce qu'ils portent bonheur*."

Un des Indiens qui m'avait accompagné au Chubat m'avait promis de m'en procurer. Il tint sa parole, et en 1875 il m'en donna une demi-douzaine et en gardait autant pour lui. Des Indiens Patagons les lui avaient apportés. Ils n'étaient pas frais et je craignis qu'en les ouvrant ils n'éclatent. C'est pour ce motif que du côté sur lequel ils reposaient la coquille est un peu attaquée et décomposée. J'en ai donné deux à M. Moreno, l'un s'est brisé ; un autre est au musée de Genève et je vous envoie les deux qui me restent.

Le *Rhea americana* est une compagne fidèle du *Cervus campestris*, comme le *Rhea darwini* accompagne au contraire le Guanaco. On admet ordinairement le Rio Negro comme ligne de démarcation entre les deux espèces, et aussi entre le Guanaco et le *Cervus campestris*. Cependant la nature est ici aussi capricieuse, et le fleuve ne représente pas une ligne rigoureuse. Le long de la côte Atlantique, j'ai vu à la "Salina del Eje" et même à la baie de St. Blas des *Rh. darwini* mêlèes avec *Rh. americana* ; et un chasseur m'a assuré avoir tué, une seule fois, il est vrai, un *Rh. darwini* près de la mer au-dessous de l'embouchure du Colorado. Dans tous ces parages on voit fréquemment des troupes d'Autruches composées d'individus des deux espèces.

Au sud de Rio Negro j'ai vu les dernières *Rh. americana* et des *Cervus campestris* sur les rives du ruisseau de Valcheta (situé à une vingtaine de lieues au sud du Rio Negro).

En 1822, lors de la fondation du Tandil, le Guanaco vivait encore dans les montagnes du Tandil ; mais il a disparu depuis longtemps. Il ne tardera pas à disparaître de la chaîne de la Ventana où il vit encore bien qu'en petit nombre. Ce n'est qu'au sud de Bahia Blanca, vers Romero Chico, qu'on commence à le rencontrer en plus grand nombre.

Mais dans les terrains de transport de la vallée du Naposta, du Sauce Grande etc., dans les couches au-dessus de la couche blanche, on rencontre fréquemment des os de Guanaco ; ce qui prouve que le Guanaco vivait en abondance dans ces parages lors du dépôt de ces alluvions. On m'a dit en avoir rencontré encore bien plus au nord, ce qui prouverait que le Guanaco est en train d'opérer sa retraite vers le Sud.

Dans ces mêmes alluvions on rencontre aussi des fragments d'œufs d'Autruche ; Mr. Wolfensperger de Zurich, qui a eu l'obligeance d'examiner au microscope les fragments que je lui ai apportés et de les comparer à des échantillons de *Rh. americana* et de *Rh. darwini*, n'est pas parvenu à déterminer à quelle espèce ils appartenaient. J'ai aussi trouvé dans ces alluvions des os d'Autruche et M. le Prof. Rütimeyer à Bâle qui a eu l'obligeance de les examiner m'a écrit que c'étaient des os du *Rh. americana* [1].

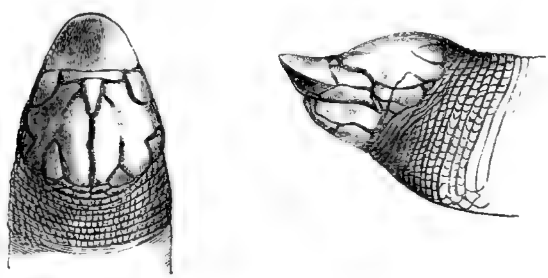
Tandis qu'on voit très fréquemment le *Rh. americana* apprivoisé chez les habitants et que cette espèce se domestique avec la plus grande facilité, c'est très rare de voir à Patagones des *Rh. darwini*. Des personnes qui en ont élevés m'ont dit qu'ils sont sujets à souffrir d'une inflammation avec formation de pus avec articulations de la jambe et qu'en captivité elles meurent plus facilement que les *Rh. americana*.

Agréez, en attendant, l'assurance de ma considération distinguée.

GEORGES CLARAZ.

Mr. Sclater pointed out that the smaller eggs exhibited could not well be those of *Rhea macrorhyncha*, as that species (or subspecies) was merely a representative form of *Rhea americana* met with in the campos of Northern Brazil [2]. In his opinion these smaller eggs were merely imperfectly developed eggs of either *R. americana* or *R. darwini*.

Mr. Boulenger exhibited a specimen of a Brazilian Amphisbænoid, *Lepidosternon polystegum*, A. Dum., the anterior half of the body of which emerged from a hole in the side of a Coral-Snake, *Elaps*



Head of *Lepidosternon polystegum*.

lemniscatus, whilst the posterior part protruded from the mouth. The Lepidosternon had been swallowed head-foremost by the Snake, and had, apparently by means of its sharp-edged cutting snout,

[1] Toutefois, le 6 Avril M. le Prof. Rütimeyer m'écrit que n'ayant pas à sa disposition de squelette du *Rh. darwini* pour comparaison, il ne serait pas impossible que les os envoyés appartiennent à cette espèce.

[2] *Cf.* Sclater, P. Z. S. 1877, p. 160, and Forbes, Ibis, 1881, p. 360.

partly forced its way out of the body of its enemy, making its escape three inches from the mouth.

The Amphisbænoid was besides interesting for the anomalous scutellation of the upper surface of the head, the sutures between the ocular, supraocular, and one of the temporals on each side, which were normally distinct in *L. polystegum*, being obliterated, as was shown in the accompanying sketch (p. 327), ; the frontal shield was also remarkably small.

Mr. Seebohm exhibited specimens of a Cormorant from Japan believed to be *Phalacrocorax capillatus* (Temm. et Schl.) and to be quite distinct from *Ph. carbo*.

The following papers were read:—

1. On the Structure of the Heart in *Ornithorhynchus* and *Apteryx*. By Sir RICHARD OWEN, K.C.B., F.R.S., F.Z.S., &c.

[Received March 11, 1885.]

The 'Note' communicated by Prof. Ray Lankester to the Scientific Meeting of the Zoological Society, March 3rd, refers to the description and figures of the heart of the *Apteryx* in the "Anatomy" of that bird recorded in vol. ii. of the 'Transactions' of the Society, 1836, pp. 271, 273; plate vi. figures 1*a*, 2, and 3. These were taken in the dissection of the trunk and viscera of a male bird transmitted from New Zealand, in spirit, and well preserved for anatomical investigation (*op. cit.* p. 258).

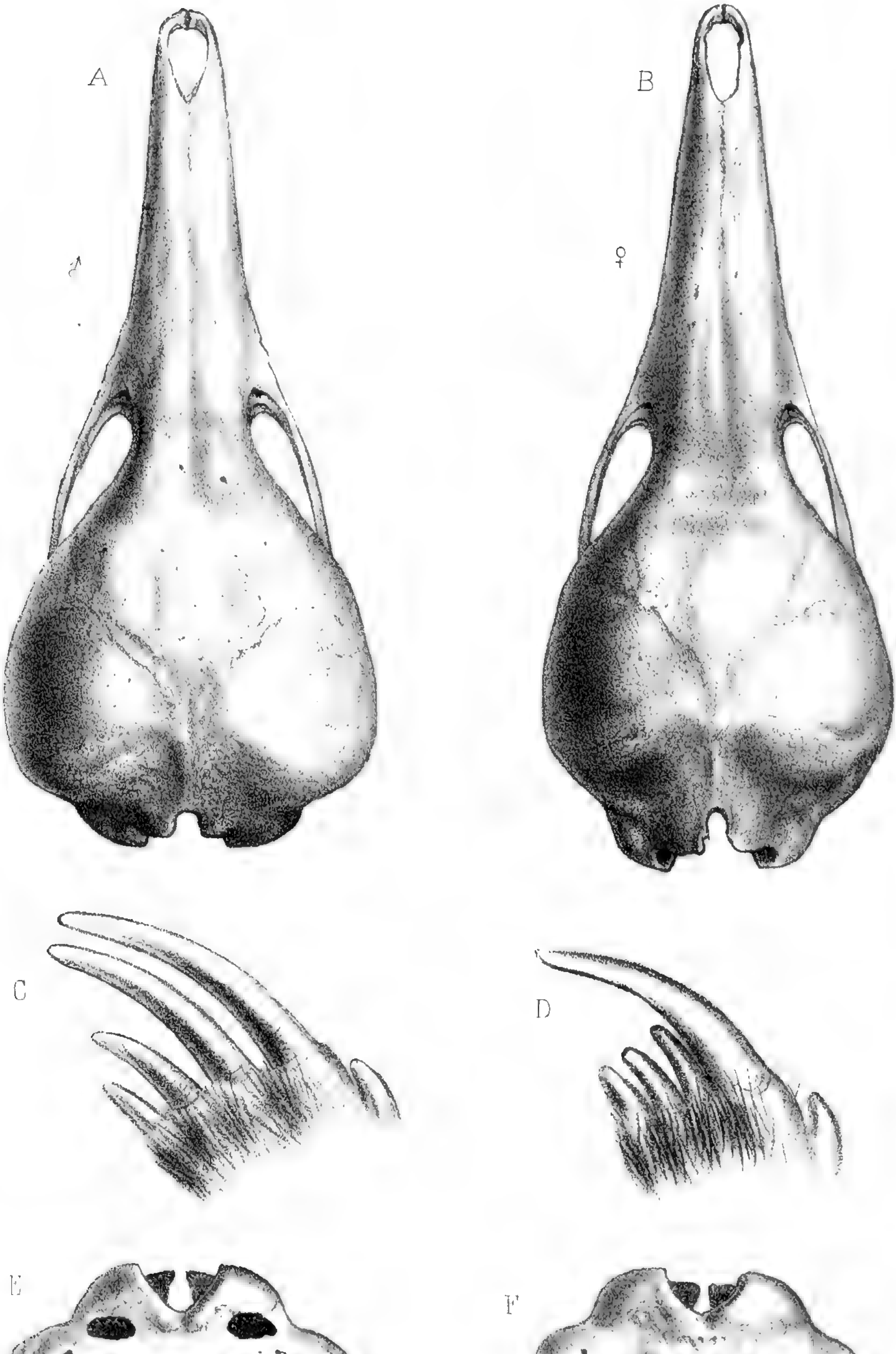
Figure 1, of pl. vi., shows the pericardium containing the heart, *in situ*, showing the apex protruding through the diaphragm into the abdomen; figure 2, ib., shows the outer form and avian symmetrical disposition of the bifurcate ascending aorta; figure 3 shows the internal structure of the right "auricle and ventricle." The principal deviation from the ornithic type of "the heart's structure is presented by the valve at the entry into the right ventricle," whereon I remark:—"We perceive in this mode of connection an approach, in the present wingless bird, to the mammalian type of valve, analogous to that which the *Ornithorhynchus* offers, in the structure of the same part, to the class of birds; for the right auriculo-ventricular valve in the *Ornithorhynchus* is partly fleshy, partly membranous" (*op. cit.* p. 273).

I heard, with pleasure, the confirmation by Prof. Ray Lankester, in his earlier 'Paper' (P. Z. S. 1882, p. 549), of the discovery recorded by me in Trans. Zool. Soc. vol. ii. p. 273. Before sending the account of it to press, I had the opportunity myself of confirming it, by receiving a third specimen of *Apteryx* sent to me for dissection. In this well-preserved specimen I found the same approach to the monotrematous type of heart; it yielded confirmation of the previous dissection of the bird, and the additional materials (*tom. cit.* p. 258), recorded in Trans. Zool. Soc. vol. iii.

J. Smit lith.

Hanhart imp.

SKULLS OF (A) ECHIDNA ACULEATA LAWESI (B) E. ACULEATA TYPICA (C&D) E. ACULEATA SETOSA.



J. Smit lith.

Hanhart imp.

A.B.C.&E. ECHIDNA ACULEATA SETOSA.
D. " " LAWESI.
F " " TYPICA.

p. 277, 1837, toward a complete monograph, "Muscular System of *Apteryx*."

If Prof. Ray Lankester should find time to refer to Trans. Zool. Soc. vol. ii. p. 271, which he deems to testify to the error he kindly proposes to rectify, he may find sufficient ground for the present Note.

I beg to express my obligation for his endeavour to expose the strange blunder into which the Professor supposes me to have fallen.

2. Notes on the Characters of the different Races of *Echidna*. By Oldfield Thomas, F.Z.S., Natural History Museum.

[Received March 10, 1885.]

(Plates XXIII.,XXIV.)

Through the kindness of Prof. Moseley, the Natural History Museum has obtained a female specimen, collected by the Rev. W. G. Lawes, of the New-Guinea *Echidna* described in 1877 by Mr. E. Pierson Ramsay of Sydney as *E. lawesi*; and, in the process of working out and making notes upon this interesting animal, I have obtained such a series of specimens of various sorts, that I find myself able to offer some notes on the characters of the different races of *Echidna*, and on their relations one to another.

Of the large series of specimens examined I would especially draw attention to:—(1) A second individual of *Echidna lawesi*, also collected by Mr. Lawes, and lent to me by the authorities of the Liverpool Museum, to whose Curator, Mr. T. J. Moore, I beg to offer my sincere thanks for the loan; and (2) the typical specimens, belonging to the Christiania Museum, of the species described by Dr. Robert Collett in this year's 'Proceedings' as *Echidna acanthion*, which have been kindly lent to me by that gentleman. I must also offer my thanks to Dr. J. G. Garson, of the Royal College of Surgeons, Dr. Lütken and Dr. Winge, of the Copenhagen Museum, Dr. F. A. Jentink, of Leyden, and Prof. A. Dubois, of Brussels, either for the loan of specimens, or for measurements, drawings, and other particulars kindly forwarded me by letter.

It was very early perceived, in fact by Sir Everard Home in 1802[1], that the Tasmanian *Echidna* was different in many respects, especially in the characters of its external covering, from that found on the mainland; but authors have not agreed as to the value to be attached to the characters of the two forms, some considering them to be quite distinct species, while others have thought them to be only climatic races, and others again have treated them as one, without taking any note of the differences that are undoubtedly present between them.

To estimate the value of these differences, to compare with the long-known southern and central forms the recently described *E. lawesi* and *E. acanthion*, and to show what differences are due respectively to age, sex, geographical distribution, and climate, are the chief objects of the present paper.

[1] Phil. Trans. 1802, p. 348, pls. x. & xiii.

To commence with, the following List of specimens examined is given. The specimens will afterwards be merely referred to by their distinguishing letters:—

Specimens.

Var. *lawesi*:—			
a. Adult skin, ♀.	Port Moresby.	Rev. W.G. Lawes.	85. 3. 24. 1[1].
b. Ditto, ♀.	Ditto.	Ditto.	1037, Liverpool Museum.
Var. *aculeata*:—			
c–e. ♂, ♀, and yg. skins.	80 miles W. of Rockhampton, Queensland.	Dr. C. Lumholz.	Christiania Mus. (Co.-types of *E. acanthion*, Coll.)
f. Imm. ♂ (in al.).	Queensland.	Sir D. Cooper.	66. 7. 3. 1.
g. Ad. sk. ♂.	Liverpool Range, New South Wales.	J. Gould, Esq.	41. 1163.
h. Ad. ♂ (in al.).	Port Stevens, New South Wales.	Dr. G. Bennett.	72. 11. 8. 1.
i–m. Skins.	No exact localities, probably New South Wales.		
n. Ad. sk.	York, West Australia.	J. Gilbert, Esq.	44. 7. 9. 18.
o. Ad. sk.	West Australia.	– Austin, Esq.	56. 4. 7. 4.
Var. *setosa*:—			
p, *q*. ♂ ♀ (in al.).	....	Dr. Müller.	64. 10. 1. 3–4.
r–v. Skins.	No exact localities, probably Tasmania.		
w, *x*. 2 ♂ (in al.).	Tasmania.	Jamrach.	69. 5. 21. 1–2.
y. ♂ (in al.).	Ditto.	Capt. Mangles.	
z. Ad. skin.	Ditto.	Ditto.	
a'. Ad., stuffed.	Ditto.	....	112 *b*.
b', *c'*. Ad. & yg., stuffed.	Ditto.	J. Gould, Esq.	41. 1162 & 4.
d'. Yg. sk. ♂.	Ditto.	Gen. Hardwicke.	112 *a*.
e'. Ad. ♂, stuffed.	Ditto.	Mr. Maddox.	238 *c*, Liverpool Mus.

Skulls.

Var. *lawesi*:—			
f', *g'*. Skulls of *a* & *b*.			
Var. *aculeata*:—			
h'–j'. Skulls of *c–e*.			
k'–m'. Ditto, *f–h*.	....	....	1017 *g*, *d*, & *h*.
n'–o'. Ditto, *k–l*.	....	....	1017 *e* & *f*.
p'. Skull.	West Australia.	....	1017 *a*.
q'. Ditto.	....	....	1017 *c*.
Var. *setosa*:—			
r'–s'. Skulls of *p* & *q*.	....	....	1006 *c* & *d*.
t'–w'. Skulls of *v*, *w*, *d'*, & *e'*.	....	....	1006 *f*, *e*, *g*, & 71, Liverpool Mus.
x', *y'*. Skulls.	....	....	1006 *a* & *b*.
z'. Imm. sk.	Tasman's Peninsula, Tasmania.	G. S. Baden-Powell, Esq.	3957, Coll. Surg.
a''. Ad. skull.	Tasmania.	R. Gunn, Esq.	3955, Coll. Surg.
b'', *c''*. Ditto.	....	....	3952 & 3958, Coll. Surg.
d''. Skull of *r*.	....	....	1006 *h*.

[1] Except where otherwise stated, these numbers refer to the registers in the Natural History Museum.

Commencing with the external characters, the first thing to be noticed is the extraordinary difference between the Tasmanian and the northern races in the relative development of the spines and the hairs on the back. The extremes are indeed much further apart than one would ever expect to occur within the limits of a single species, but these extremes grade into each other on the examination of a large series.

In the true *E. aculeata* of New South Wales we find that average specimens are covered with a thick coating of long stout spines, from 35 to 60 millim. in length, with a very sparse and thin undergrowth of hair, visible only upon separating the spines, and quite hidden in the ordinary position of the animal. The head, belly, and legs are covered with a mixture, in about equal proportions, of flattened semi-spinous bristles, and of thin, more or less woolly, hairs. Passing northwards, we find that in Queensland specimens (*E. acanthion*) the hairs of the back are still more reduced as compared to the spines, and that on the belly the flattened bristles tend entirely to supersede the hairs, a tendency carried out completely in *E. lawesi*, where, except in the neighbourhood of the pouch, the belly-hairs are entirely suppressed, and the head and underside are evenly though thinly covered with bristles only. On the other hand, probably owing to the moister climate of New Guinea, the hairs on the back somewhat reassert themselves at the expense of the spines, being in specimen *a* decidedly more visible than in average *aculeata*, and in *b* nearly as prominent as in *setosa*, the spines in both being reduced to from 20 to 35 millim. in length.

Going now southwards from New South Wales, we find that the hair, as compared on the back with the spines, and on the belly with the bristles, rapidly gains the upper hand, until in Tasmanian specimens the spines, especially along the middle of the back, are almost entirely hidden, and the bristles below suppressed, both upper and under sides being clothed with thick woolly hair, some 20 millim. in length, a state of things obviously resulting from the moister and colder climate of Tasmania. There is also a good deal of variation in specimens from the same localities, probably owing to seasonal change; but as I have no dated specimens available, I am unable to speak definitely on this point.

But as to the specific value of this hair-development, we soon find, on looking through a large series, that there are specimens which do not conform to the general rule as to locality; thus specimen *f* from South Queensland, the centre of the *aculeata* range, has its hairy covering developed almost precisely as in average Tasmanian individuals. Again, the fact that the New-Guinea Echidna, coming from a moist though hot climate, should tend to resemble the Tasmanian race in the length of the hair and shortness of the spines on the back, is alone strongly confirmatory of my view that the greater or less development of the hairs is a character so directly climatic, and so easily affected in different localities by a greater or less degree of wet and cold, that it cannot be taken as indicating real specific distinction.

The colour of the *Echidna* varies somewhat owing to the relative development of the hairs and spines and the comparative amounts of brown and white on the latter; but the only strictly geographical variation in colour that I can distinguish, is that southern specimens have a general tendency to have the crown of the head a lighter brown than the back, the converse being the case in northern ones. This is, however, by no means invariable.

The next thing to be considered is the relative lengths of the hind claws, on which great stress has been laid by Dr. Lütken[1], Dr. Collett[2], and others, and indeed the differences in this respect are very remarkable, and might easily be taken to represent specific distinction. The extreme forms are represented by figs. C and D on Plate XXIV., and it will thus be seen that in one form (C) the third claw is nearly as long and as stout as the second, and about twice the size of the fourth; while in the other form (D) the third is scarcely bigger than the fourth, and not more than from one third to one half as large and as strong as the second. The following are the measurements of two extreme examples:—

	Second claw. millim.	Third claw. millim.	Percentage.
Specimen *s* (Tasmania)	44	39	89
,, *g* (N. S. W.)	39	14	34

This character runs for the most part parallel with geographical distribution, the southern forms having in a general way the long third claws, and the northern the short ones: thus 13 typically hairy specimens of var. *setosa* have percentages ranging from 70 to 100; while the percentages of northern specimens are:—(*e*) 32, (*g*) 34, (*a*) 37, (*b*) 39, &c.; but, so far as regards specific distinction based on this character, we find that certain individual specimens entirely upset the general rule. Thus specimen *l*, very spiny and obviously from the north, has a third claw 28 millim. long, and bearing a percentage to the second of 80, the general size and proportions of claws being quite as in average *E. setosa.* Specimen *f*, also from Queensland, has a third claw 33 millim. long, and 79 per cent. of the second. The two northern races *E. lawesi* and *E. aculeata* are absolutely indistinguishable from each other by this character.

The reason for the greater length of the third claw in var. *setosa* is not very evident; but it may be that the heavier and richer soil of Tasmania requires a more powerful digging organ for its removal, and that by the increase of the length of the third claw this extra power is gained, for it is obvious that in the races with short third claws, the long second one does practically all the work, the third being almost functionless. But by the enlargement of the latter to a nearly equal length with the second, extra power is gained by both claws working side by side, and thus making a broader and stronger digging organ.

Passing now to the characters of the skull, more important and more interesting than any external characters can be, we must first study the influence that age and sex have upon its form and size,

[1] P. Z. S. 1884, p. 150. [2] P. Z. S. 1885, p. 148.

these being, in the absence of teeth, the only characters available for comparison.

With regard to age the following are the measurements of two skulls, both of var. *aculeata*, and both from Central Queensland :—

	Greatest length[1].	Greatest breadth.	Index of breadth[2].	Length of brain-case[3].
	mm.	mm.		mm.
i'. Adult....	110·0	45·0	40·9	52·0
j'. Young ..	94·0	44·0	42·5	48·0

	Length of rostrum[4].	Rostral index[5].	Interorbital breadth.	Capacity[6].
	mm.		mm.	c.cm.
i'. Adult....	52·0	100	14·5	22
j'. Young ..	40·0	83	17·0	22

Taking these two as examples, we see that young skulls have comparatively large rounded brain-cases, short snouts, and broad interorbital spaces. In growing older the size of the brain is nearly unaffected, but the rostrum lengthens and seems to become more distinctly bent upwards ; the sutures close, and the various fontanelles fill up, with the exception that the vacuities on the base of the skull, just in front of the condyles (the "condyloid vacuities"), when present, do not apparently close until extreme old age. Altogether, however, there is probably more difficulty in determining the age of specimens of this group than in any other mammals, chiefly of course owing to the want of teeth ; and it is only by a comparison of a considerable series that any satisfactory estimate of age can be made.

With regard to the condyloid vacuities another element than age seems to enter into the question. Some specimens, although quite young, have no vacuities (*e. g.* specimen *j'*), while others fully adult, such as *r'*, *s'*, *u'*, &c., have large and open ones (see Plate XXIV. figs. E and F) ; and this seems to depend in a large measure on locality, as very nearly all the specimens of *E. setosa* that I have seen have open vacuities, while without exception the long-spined northern examples have closed ones. This cannot, however, be used as a specific character, as is shown by the fact that the skull *z'*, from Tasman's Peninsula, Tasmania (No. 3957, Coll. Surg.), although only half-

[1] From the tip of the premaxillæ to the most posterior point of either condyle.

[2] Length : breadth : : 100 :—

[3] From the centre of the lower edge of the *foramen magnum* (*basion* of anthropologists) to a point on the palate level with the anterior edge of the lachrymal foramen. This foramen is sometimes entirely closed up, but its position can always be easily made out.

[4] From the same point on the palate to the tip of the premaxillæ.

[5] Length of brain-case : length of rostrum : : 100 :—

[6] Measured with No. 8 shot.

The indices Nos. 2 and 5 are of the greatest service, as giving a far more exact idea of the proportions of the skull than any mere measurements can do. The "rostral index" is especially useful in the present group, as the relative length of the snout has such an important bearing upon the general form of the skull.

grown, has yet no trace whatever of condyloid vacuities. To account for the general rule as to these vacuities, I would suggest that it is just possible that desert animals obtain a greater abundance of carbonate of lime and other bone-forming salts than those that live on a rich moist soil, and that the latter would therefore rather avoid using up bony matter in covering a place naturally so well protected by the surrounding flesh and bone as the base of the brain-case, while the former would have no reason to be sparing in the formation of bone[1]. The exception to the rule would also be easily accounted for on this theory, as individuals would naturally occur in particular localities where the soil was either more or less sandy and impregnated with carbonate of lime than the general average of the country.

Passing to the differences due to sex, we find that there is very little constant difference between male and female skulls. In a general way male skulls are broader and heavier, with higher and more inflated brain-cases, larger capacities, and shorter, broader, and heavier snouts. Male and female skulls r' and s', being of the same variety, from the same locality, and apparently of exactly the same age, have been figured, Plate XXIV. figs. A and B, and show very fairly the differences attributable to sex.

Eliminating now all characters due either to age or sex we come to the question as to those really distinctive of the different races; and these appear to resolve themselves into two, namely, a marked decrease northwards in the breadth and capacity of the brain-case, and at the same time a slight increase in the relative length of the rostrum. These points are brought out in Plate XXIII. figs. A–D, where the gradual change in form and size from north to south is shown. The following Table, based on fully adult specimens only, gives, by means of averages and indices, further evidences of this general rule.

A study of this Table at once shows the general relationship that the size and shape of the skulls bear to their localities, and at the same time shows that this relationship is not sufficiently constant to serve as the basis for specific distinction; for while the average measurements and indices show distinct geographical variation, yet in several cases individual members of one group fall within the range of variation of the next; and therefore no definition can be framed to embrace all of one variety and to exclude all of another. It is true that the two specimens of var. *lawesi* have their breadth, index of breadth, and capacity markedly below, and their rostral index markedly above, any individuals of the other races; but this is obviously owing to the want of more material, since there are only two specimens available for comparison, *both of which are females*; and it must especially be remembered that the points of difference just noted in *E. lawesi* are the very ones in which the sexes differ from each

[1] Mons. F. Lataste (Bull. Soc. Acclim. (3) x. p. 369, 1883) has shown that desert animals, such as *Dipodillus simoni* and *Pachyuromys duprasi*, are certain to die of rickets and other bone-diseases if, when in captivity, they are not supplied with abundance of carbonate of lime; a fact which proves that such desert animals are accustomed to a more liberal supply than usual of this or some allied bone-forming salt.

	Greatest length.	Greatest breadth.	Index of breadth.	Length of brain-case.	Length of rostrum.	Rostral index.	Capacity.
	mm.	mm.		mm.	mm.		c. cm.
Var. *lawesi.*							
f'. ♀. Port Moresby	106·0	39·7	37·5	48·0	52·5	109·4	18
g'. ♀. Port Moresby	108·4	41·0	37·8	48·0	55·0	114·6	17
[*Hypothetical* ♂	104·7	43·2	41·3	48·3	50·6	104·9	19·5]
Var. *aculeata.*							
h'. ♂.[1] Central Queensland	104·0	43·5	41·8	53·0	45·3*	85·5*	23
i'. ♀. Central Queensland	110·0	45·0	40·9	52·0	52·0	100	22
n'. ♂. ?	118·0	47·8	40·5	58·0	54·0	93·1	
p'. West Australia	104·0	43·3	41·6	48·4	49·6	102·5	26
q'. ?	118·5	49·0	41·4	55·5	57·2	103·1	27
Var. *setosa.*							
r'. ♂	108·4	49·0	45·2	52·3	49·0	93·7	30
s'. ♀	111·0	45·7	41·2	52·0	52·0	100·0	27
u'. ♂. Tasmania	118·5	48·5	40·9	53·8	57·7	107·2	33
x'. Tasmania	107·7	45·5	42·2	51·0	50·0	98·0	29
y'. Tasmania	101·0	45·0	44·6	49·5	45·0	90·9	28
a''. Tasmania	103·7	46·0	44·4	49·3	48·5	98·4	28
b''.	111·0	49·6	44·7	54·0	51·0	94·4	37
d''.	125·0	54·0	43·2	58·0	59·0	101·7	
Averages:—							
Var. *lawesi*	107·2	40·3	37·6	48·0	53·7	112·0	17·5
Var. *aculeata*	110·9	45·7	41·2	53·4	53·2	99·7	24·5
Var. *setosa*	110·8	47·9	43·3	52·5	51·5	98·0	30·3
[*Proechidna bruijnii.* New Guinea	167·0	53·5	32·0	58·0	100·0	172·4	44·0]

[1] This specimen seems to have an unnaturally short snout, and therefore the rostral length and index (*) are not included in the general averages below.

other, and that a male *lawesi* would probably be very much more like *aculeata* than are the two females examined. To show this the dimensions of a hypothetical male skull, based by simple rule of three on the relations to each other of specimens r' and s', the typical male and female skulls of *setosa* already described and figured, have been placed below those of the female specimens of *lawesi* in the table, and these, which are probably not very far from what average male skulls would measure, show that no sharp dividing line can be drawn between the skull proportions of *lawesi* and *aculeata*. Still less can one be drawn between *aculeata* and *setosa*, as the various numbers intergrade completely.

I regret that I am unable to retain, even as a variety, *E. acanthion*, Collett, the types of which have been kindly lent to me by the describer. It seems to me to be what I might call a hyper-typical form of *aculeata*, not worthy of a separate name, but exceedingly interesting as supplying the much needed intermediate link between *E. aculeata* and *E. lawesi*.

With regard to the interesting character of cranial capacity, the variation between the different races and individuals is extremely striking, such a range as from 17 to 37 c. cm. being probably unequalled among mammals; and even within the varieties we find such ranges as from 22 to 27 in *aculeata*, and from 27 to 37 in *setosa*. The even increase of capacity, however, from north to south is a fact of great interest, and gives an excellent example of the general law as to increase of size with increase of latitude, which is now one of the most fully recognized of the laws governing the variation of mammals.

This law, however, as Mr. J. A. Allen has shown [1], is reversed in the case of essentially tropical groups, their members then becoming smaller and smaller according as they live further and further away from what Mr. Allen calls their "centre of distribution." The fact therefore that *Echidna* conforms to the general rule is exceedingly interesting, and tends to prove that it is essentially a temperate and not a tropical genus, and that the New-Guinean *E. lawesi* must be looked upon as a more or less degenerate tropical offshoot of *E. aculeata*. But, on the other hand, speaking of the whole family, its very largest member, the *Proechidna bruijnii*, occurs at the most northern and tropical situation of all, namely in north-western New Guinea; so that this is in direct contradiction to Mr. Allen's further rule that the largest species of a family are those that have their habitat nearest to its "centre of distribution." We have therefore in the *Echidnidæ* the apparent anomaly of two centres of highest development, the one, tropical, applying to the family as a whole, and causing *P. bruijnii* to be its largest member, and the other, temperate, applying to the individuals of the only widely spread species, and causing them to increase steadily in size from north to south.

On the whole I think that the facts as to the relations to each other of distribution and size in this group tend to show that the genus *Echidna* has existed more or less in its present form for a

[1] Bull. U. S. Geol. Surv. ii. p. 310.

very long time in Australia—long enough in fact to eliminate any specially tropic-loving tendencies it may have inherited from the ancestors common to it and to *Proechidna.*

In this connection it should be just noted that the Pleistocene species *E. oweni*, Krefft[1], from New South Wales, was at least one third larger than the largest existing species of the family.

Comparing the skull-capacity of these Echidnas with the total weight of their bodies, we find that (after being in spirit some years),

Specimen	*w*,	with a capacity of	33 c. cm.,	weighs about	2000 grammes.
„	*p*,	„	30	„	2600 „
„	*q*,	„	27	„	2800 „

The capacity in cubic centimetres going into the weight in grammes respectively 60, 87, and 104 times; and thus comparing very favourably with the proportions in man, in whom, taking the average capacity as 1500 c. cm., and the average weight as 65,000 gr., the former goes into the latter 43 times. This rough comparison is, however, affected in one direction by the general rule that smaller animals have higher capacities in proportion to their weight than larger; and in the other by the increase of the weight of the specimens of *Echidna* by the spirit which had soaked into the flesh, and could not be dried out. The thick coat of spines also must add an appreciable amount to the weight of so small an animal.

The cranial capacity of a fine Ornithorhynchus, with a skull 113 mm. in length, I find to be 17 c. cm., and therefore only equal to the very smallest of the Echidnas examined.

To sum up the general conclusions arrived at, we find that certain well-known laws of climatic and geographical variation have caused the original *Echidna* to show certain modifications at the extremities of its range as follows:—

	Result.
1. The inhabitants of a wet and cold climate need a warm covering.	Long thick hair of var. *setosa.*
2. A moist and fertile soil is heavier to work than a dry and sandy one.	Greater digging power of var. *setosa* by increase of length of third hind claw.
3. A cold climate produces greater size, and, at the same time,	Greater size, especially marked by larger skull and brain-capacity of *setosa.*
4, a reduction and shortening of extremities.	Shorter snout of var. *setosa.*
[? 5. On moist and heavy soils there is a less supply of carbonate of lime available for bone-making purposes than on sandy.]	Greater tendency of var. *setosa* to have open vacuities on base of skull.

[1] Ann. Mag. N. H. (4) i. p. 113 (1868). Probably the same as *E. ramsayi*, Owen, Phil. Trans. clxxv. p. 273, pl. xiv. (1884).

These modifications are, so to speak, the characters of incipient species; but in my opinion they have neither yet gone far enough, nor are yet sufficiently constant to necessitate our recognizing more than a single species of true *Echidna*, with three geographical varieties, of which the characters and synonymy are as follows.

1. E. ACULEATA LAWESI. (Plate XXIII. fig. A.)

Tachyglossus lawesi, E. P. Ramsay, P. Linn. Soc. N. S. W. ii. p. 31 (1877), iii. p. 244 (1879); A. Dubois, Bull. Soc. Zool. vi. p. 268 (1881); Peters & Doria, Ann. Mus. Genov. xvi. p. 688 (1881).

Hab. New Guinea (as yet only known from Port Moresby).

Size small. Spines rather short, with the hairs partly visible between them; crown of head, belly, and legs clothed almost entirely with flattened bristles. Third hind claw only from one third to one half the length of the second, and but little larger than the fourth.

Skull small and very narrow (breadth about 41 mm.; index 37 or 38), with a small low brain-case (capacity 17 or 18 cubic centimetres), and with a proportionally long slender snout (rostral index, 109–114). No condyloid vacuities.

2. E. ACULEATA TYPICA. (Plate XXIII. fig. B.)

Myrmecophaga aculeata, Shaw, Nat. Misc. iii. pl. 109 (1792).

Ornithorhynchus hystrix, Home, Phil. Trans. 1802, p. 348, pl. x.

Echidna aculeata, Waterhouse, N. H. Mamm. i. p. 41 (1846); Flower & Garson, Cat. Coll. Surg. ii. p. 751 (1884).

E. hystrix, Cuv. Règn. Anim. i. p. 226 (1817); Gould, Mamm. Austr. i. pl. ii. 1852; Mivart, Tr. Linn. Soc. xxv. p. 379 (1866); Murie, J. Linn. Soc. xvi. p. 413 (1878) (*et auctorum plurimorum*).

E. australiensis, Less. Man. Mamm. p. 318 (1827).

E. longiaculeata, Tiedem. Zoologie, i. p. 592 (1808).

E. acanthion, R. Collett, Forh. Vid. Selsk. No. 13; P. Z. S. 1885, p. 150.

Hab. The whole continent of Australia.

Size medium. Spines very long, entirely hiding the hairs; crown of the head, belly, and legs covered with a mixture of hairs and bristles. Third hind claw as in *lawesi*.

Skull of medium size and proportions (breadth 43–49 mm., index 40 to 42), with a medium-sized brain-case (capacity 22–27 c. cm.), and a long slender snout (rostral index generally from 93 to 103). Condyloid vacuities generally absent.

3. E. ACULEATA SETOSA. (Plate XXIII. figs. C and D.)

"Another species of *Ornithorhynchus*," Home, Phil. Trans. 1802, p. 357, pl. xiii.

Echidna setosa, Cuv. Règn. Anim. i. p. 226 (1817); Waterh.

N. H. Mamm. i. p. 47 (1846); Gould, Mamm. Austr. i. pl. iii. (1849).

E. breviaculeata, Tiedem. Zoologie, i. p. 592.

Hab. Tasmania.

Size large. Spines short and stout, more or less hidden by the long fur, especially in the centre of the back. Crown of head, belly, and legs covered witn thick woolly fur, unmixed with bristles. Third hind claw very nearly as stout and long as the second.

Skull large and broad (breadth 45–50 mm., index 41–45), large rounded brain-case (capacity 27 to 37 c. cm.), and a comparatively short, stout snout (rostral index generally from 90 to 100). Condyloid vacuities generally present.

It may be useful in this connection to give the synonymy of the three-toed Echidna, an animal which, although not yet ten years known, has become possessed of the following formidable array of names:—

PROECHIDNA BRUIJNII.

Tachyglossus bruijnii, Peters & Doria, Ann. Mus. Genov. ix. p. 183 (1876), xvi. p. 687 (1881).

Acanthoglossus bruijnii, Gervais, C. R. p. 990 (1877); Journ. Zool. vi. p. 375; Ostéogr. Monotr. p. 41 (1877).

Proechidna bruijnii, Gervais, Ostéogr., Monotr. p. 43 (1877 ; Murie, J. Linn. Soc. xvi. p. 417 (1878); Flower & Garson, Cat. Coll. Surg. ii. p. 753 (1884).

Bruijnia tridactyla, A. Dubois, Bull. Soc. Zool. vi. p. 266, pls. ix. and x. (1882).

Proechidna villosissima, A. Dubois, Bull. Mus. Belg. iii. p. 110, pl. iv. (1884), *juv.*

For the sake of comparison, the measurements and indices of a skull of this species have been placed at the bottom of the table on p. 335.

EXPLANATION OF PLATES.

PLATE XXIII.

Upper view of skulls of *Echidna* to show geographical variation in size.

Fig. A. Skull of *Echidna aculeata lawesi*, ♀; *g'* of list.
B. Skull of *Echidna aculeata typica*, ♀; *i'* of list.
C. Skull of *Echidna aculeata setosa*, ♀; *s'* of list.
D. ,, ,, ,, *b''* of list.

PLATE XXIV.

Figs. A and B. Skulls of *Echidna aculeata setosa*, ♂ and ♀; *r'* and *s'* of list, showing sexual difference in form.
C. Left hind foot of *Echidna aculeata setosa*.
D. Left hind foot of *Echidna aculeata lawesi*.
E. Back part of base of skull of *Echidna aculeata setosa*, showing open condyloid vacuities.
F. Back part of base of skull of *Echidna aculeata typica*, showing vacuities closed.

3. On the Anatomy, Classification, and Distribution of the Arctoidea. By St. George Mivart.

[Received April 15, 1885.]

In 1882 I had the honour of laying before this Society some notes on the Classification and Distribution [1], as also on the Anatomy, [2] of the Æluroidea.

The homogeneous group of the Cynoidea has been pretty exhaustively treated of in successive papers in the 'Proceedings' of this Society by Mr. Waterhouse [3], Mr. Turner [4], Professor Flower [5], and Professor Huxley [6].

It remains to offer some supplementary remarks upon the remaining and third Suborder of Fissiped Carnivora, that is the Arctoidea. It was my intention that my notes on this suborder should have followed quickly upon my papers above referred to, but the carrying out of that intention was unavoidably delayed by illness.

The animals comprised under the designation Arctoidea were not regarded by Mr. Waterhouse as forming a single group in that paper of his, on the Crania of the Carnivora, which formed the starting-point of the subsequent papers on the classification of the Carnivora in the 'Proceedings' of the Zoological Society. In that paper [7] he divides the Carnivora into the six families *Canidæ, Viverridæ, Felidæ, Mustelidæ, Ursidæ,* and *Phocidæ,* and about the fourth and fifth of these (which make up the Arctoidea) he makes the following remarks:—

"The *Mustelidæ,* like the *Felidæ,* have the muzzle short and obtuse; the skull, however, is more elongated. They may be distinguished by there being one true molar on either side of each jaw; that in the upper jaw is well developed and generally transverse, but in some, such as the Badger, it is longer than broad; in the Otters, Skunks, and American Badger (*Taxidea labradorica*), the true molar is intermediate in form between that of the Common Badger (*Meles vulgaris*) and the typical *Mustelidæ.* The false molars in the Weasels (*Mustela*) are typically $\frac{3-3}{4-4}$, but in some species they are reduced to $\frac{1-1}{3-3}$. As in the *Felidæ,* the angle of the lower jaw, in the greater portion of the *Mustelidæ,* is on the same plane as the lower edge of the horizontal ramus; it other Carnivora it is raised. In this family there is a tendency in the glenoid cavity of the temporal bone to enclose the condyle of the lower jaw. The condyle is

[1] See P. Z. S. 1882, p. 135.
[2] *L. c.* p. 459.
[3] P. Z. S. 1839, pp. 135–137.
[4] *L. c.* 1848, pp. 82–87.
[5] P. Z. S. 1869, pp. 23–26, and also 35 & 37; figs. 11 & 12, p. 25.
[6] "On the Cranial and Dental Characters of the Canidæ," P. Z. S. 1880 pp. 238–288. A very elaborate paper, illustrated by sixteen woodcuts.
[7] P. Z. S. 1839, p. 135.

more truly cylindrical, and longer than in other Carnivora. In the Dogs there is no trace of the anterior descending process of the temporal bone, which in the Mustelas confines the condyle of the lower jaw; in other Carnivora there is always a slight trace of the process, but in none does it enclose the condyles, as in most of the *Mustelidæ*.

"The genera contained in this family are *Mustela, Zorilla, Galictis*, Bell (which must not be confounded with the *Galictis* of Is. Geoffroy St. Hilaire, published in the 'Comptes Rendus' for October 1837, p. 581), *Mellivora, Ursitaxus, Helictis*, and *Gulo*, in which the true molar of the upper jaw is transverse; *Lutra* and *Mephitis*, in which the tooth approaches more or less to a square form; *Taxidea*, in which it is triangular; and, lastly, *Meles, Arctonyx*, and *Mydaus*, in which the true molar is longer than broad.

"In the *Ursidæ* there are two well-developed true molars on either side of each jaw; the 'carnassière' [1] here has changed its functions, not being suited, as in other Carnivora, to cutting flesh. The palate is considerably elongated. In the Bears (*Ursus* and its subgenera) it is small, being robbed as it were of its nutriment by the true molars, which are very large. In the other *Ursidæ* (*Procyon, Nasua, Cercoleptes, Arctictis* [2], and *Ailurus*), the 'carnassière,' especially that of the upper jaw, and the true molars are nearly equal in size, and also nearly resemble each other in other respects. [3]

"In the true Bears the form of the lower jaw differs from that of any of the preceding Carnivora in having a projecting process on the underside of the ramus, and situated a little in advance of the angle of the jaw. The same character is also found in many Seals, which in several other respects appear to approach the Bears." [4]

Mr. Waterhouse's two families *Mustelidæ* and *Ursidæ* were united by the late Mr. H. N. Turner [5] into the single family *Ursidæ*, which was equivalent to the group here designated Arctoidea, and which he divided into the four subordinate groups (1) *Ursina*, (2) *Ailurina*, (3) *Procyonina*, and (4) *Mustelina*. As to these groups, Mr. Turner has expressed the following views, and made the following observations:—

"In the Ursina we find no trace of a pterygoid fossa, the outer pterygoid process being closely pressed against the inner one, or true pterygoid bone, and sending off a strong lamina of bone to

[1] The "carnassière" is the sectorial tooth, *i. e.* the fourth upper premolar, against which the lower sectorial, or first lower true molar, bites.

[2] That *Arctictis* is not an Arctoid but an Æluroid is now universally known and admitted, though De Blainville figures it amongst the members of his genus "*Subursus*."

[3] Mr. Waterhouse adds in a note:—"From an examination of the external characters of *Bassaris astuta*, it appears to me that it belongs to this group," *i. e.* to the *Ursidæ*.

[4] I have thought it worth while to reprint this extract, as being of so old a date as to have a certain historical interest, and because many Fellows of the Society may not possess the 'Proceedings' of so many years ago.

[5] P. Z. S. 1848, pp. 75–86.

enclose the alisphenoid canal, and, almost from its apex, a strong column of bone which runs backwards, extending behind the foramen ovale, which it quite converts into a canal. The auditory bulla, although, from the flat surface which it presents, it scarcely merits the name, yet may be perceived to show the same essential character as in the Weasels, which is, that it rises suddenly on the inner side at once to its greatest prominence, and is then flattened off towards the meatus, which is rather prolonged. The course of the internal carotid artery, as indicated by the canal excavated for it in the bone, is as follows: It enters by a true canalis caroticus excavated in the bone of the ear, commencing quite behind, in the same fissure in which open the foramen jugulare and the aperture, through which the nervous vagus issues from the skull, and, extending forwards in a slightly arched direction, again emerges anteriorly, and, curving round, enters the cranium in a backward direction, through a round foramen between the sphenoid bone and that of the ear, close to the aperture from which the Eustachian tube would issue, and corresponding to the foramen lacerum anterius; there is a distinct foramen glenoideum, although opening rather more inwardly than usual; the mastoid and paroccipital processes are both largely developed, and, owing to the very slight projection of the auditory bulla, stand out very distinct and prominent; the foramen condyloideum anterius occupies an exposed situation; the foramen condyloideum posterius I have never seen in any skull but the human, and here it is said to be sometimes wanting. The characters presented by the lower jaw in the Bears are essentially those most usual, though not quite constant, among the Weasel group; the angular process is pushed up very near to the condyle, and much flattened beneath; the form of the coronoid process is somewhat that of the true Weasels, but owing to the jaws being in the Bear more pushed forwards, relatively to the situation of the cranial cavity, than in the Weasels, this process is more pushed backwards to meet the temporal muscle. With regard to the little process projecting beneath and anterior to the angle of the jaw, it is a mere superaddition, which appears again in *Cercoleptes*, as also in *Otocyon* and *Nyctereutes*, when it has the form of a large vertical lamella, projecting from the lower surface of the jaw; it is also seen like a second angular process in the Seal, so that I should not feel inclined to assign to it more than a generic value.

"In the Mustelina the pterygoid appendages very seldom manifest any tendency to form a fossa, although in many species the outer surface is rough and marked with ridges for muscular attachment; from behind is continued most usually a ridge which runs backwards and outwards along the lower and posterior margin of the foramen ovale. This group is constantly marked by the entire absence of the alisphenoid canal. In the remaining characters this group presents no essential difference from the Bears; the commencement of the canalis caroticus is usually near the middle of the inner side of the auditory bullæ, and anteriorly the vessel does not again quite reach the outside of the cranium, simply showing itself at the point where it doubles, through the cartilage covering the foramen lacerum anterius.

"The modifications of the bulla mostly depend on the size of the species, it being much more swollen in the smaller ones; the mastoid and paroccipital processes are also developed in relation to the dimensions of the species, or even the age of the individual; in the smallest species they have hardly any projection, while in the larger ones they show the same essential structure as in the Bears.

"Among the characters which I have pointed out in the base of the cranium, it will be seen that the only tangible distinction between the Bears and the Weasels is the presence of the alisphenoid canal in the former, and its constant absence in the latter. Much as I have insisted upon the importance of this character as assisting to distinguish groups, I do not consider it sufficient alone to entitle the groups which it separates to the rank of *families*; neither am I prepared to admit the difference of the teeth sufficient for that purpose, these being mere adaptive modifications. In the true Bears the number of true molars is on each side *two* above and *three* below. In the Weasels it is only *one* above and *two* below. In the Subursine group, to which I must add *Bassaris*, it is *two* above and *two* below; and among these it is only *Ailurus* which possesses the alisphenoid canal."

He further expressed his views in a synopsis as follows:—

"Fam. URSIDÆ.

"Auditory bulla rising suddenly on its inner side, and more or less flattened off towards the meatus.

"Paroccipital process prominent, and neither flattened on the surface of the auditory bulla, nor laterally compressed.

"Foramen condyloideum exposed. A considerable foramen glenoideum.

"*No* cæcum. *No* Cowper's glands.

"Prostate gland not salient, being contained in the thickened walls of the urethra.

"Subfamily URSINA (of general geographical distribution).

"A distinct alisphenoid canal.

"Internal carotid artery reappearing externally, after passing through its canal, and doubling back to enter the cranium.

"True molars on each side $\frac{2}{3}$.

"*Ursus* (including the subgenera).

"Subfamily AILURINA (confined to India).

"A distinct alisphenoid canal.

"True molars on each side $\frac{2}{2}$.

"*Ailurus.*

"Subfamily PROCYONINA (confined to America).

"No alisphenoid canal.

"True molars on each side $\frac{2}{2}$.

Procyon.	*Cercoleptes.*
Nasua.	*Bassaris.*

"Subfamily MUSTELINA (of general geographical distribution).

"No alisphenoid canal.

"True molars on each side $\frac{1}{2}$.

Arctonyx.	*Grisonia.*
Meles.	*Galera.*
Taxidea.	*Vison.*
Mydaus.	*Mustela.*
Mephitis.	*Martes.*
Gulo.	——
Helictis.	*Lutra.*"
Mellivora.	

The distinctions and observations of Mr. Turner have been further developed and perfected by Professor Flower in his elaborate paper on the Classification of the Carnivora [1], wherein the principal cranial characters of nearly all the Arctoid genera are described, with figures of the skulls of *Ursus, Putorius, Procyon,* and *Bassaris* (figs. 1, 2, 3, *3a,* and 4), and their points of agreement are summed up as follows [2]:—"They all agree in having the intestinal canal without a cæcum, all other known Carnivora [3] possessing this appendage. Moreover they all agree together, and differ from all other Carnivora, in the structure of the generative organs of the male, facts of considerable value in determining affinities. They all have a large penis, with a very considerable bone, which is usually more or less curved, somewhat compressed, not grooved, dilated posteriorly, and often bifurcated, or rather bilobed, in front. They are all destitute of Cowper's glands. All have the prostate rudimentary, or consisting only of a thickening of the wall of the urethra and forming no distinct prominence.

"Among all the diversity in the characters of the base of the cranium, especially in the form of the auditory bulla, the following points of general agreement are to be found:—

"(1) The cavity of the bulla is simple (compared with *Felis*). That is, although there are frequently trabeculæ or partial septa passing mostly transversely across the lower part, and generally connected with the tympanic ring, there is no distinct and definite septum dividing it into a separate outer and inner chamber. In all cases, on looking into the external auditory meatus (in the dried skull when the membrana tympani is removed) the opposite wall of

[1] P. Z. S. 1869, p. 4. [2] *L. c.* p. 14.

[3] Subsequently Prof. Flower discovered that the cæcum is absent in *Nandinia.* It may also be entirely absent in *Arctictis.*

the bulla can be seen, or if a probe is passed into the meatus, no obstacle will prevent its touching the inner wall. Whatever the diversity of development of the bulla, it always has its greatest prominence near the middle of the inner border, and slopes away from that point, not only externally, but also forwards and backwards.

"(2) The inferior lip of the external auditory meatus is always considerably prolonged.

"(3) The paroccipital process is more or less triangular, and directed backwards, outwards, and downwards, standing quite aloof from the bulla. This relation depends chiefly on the want of development of the posterior portion of the bulla, and is absent or obscure in *Mustela* alone.

"(4) The mastoid process is widely separated from the paroccipital, and generally very prominent.

"(5) The carotid foramen is always large, and placed usually near the middle, but sometimes more posteriorly, on the inner margin of the bulla. It is generally very conspicuous, but sometimes partially concealed by the projecting lip of the basioccipital.

"(6) The condyloid foramen is distinct and exposed, and although sometimes partially overlapped posteriorly by a ridge of bone passing from the paroccipital to the condyle, it is never sunk into a common opening with the foramen lacerum posticum.

"(7) The glenoid foramen is always present, and generally very conspicuous. In *Enhydris* it is least so.

"(8) The alisphenoid canal is present in the true Bears and *Ailurus*, absent in all the others. Hence it cannot be used to characterize the entire group, though useful in aiding its subdivision.

"The group thus defined is, I think, too extensive, and presents too great variation among its members, in dentition and external characters, to constitute a family, as proposed by Mr. Turner. I would rather regard it as a primary section of the fissipedal Carnivora, to which the name of ARCTOIDEA might be given.

"I perfectly agree with Mr. Turner that it is further divisible into four chief sections, or families as I should call them—the *Ursidæ*, *Ailuridæ*, *Procyonidæ*, and the *Mustelidæ*.

"Of the Arctoidea, the true Bears are the most specialized or aberrant; they form a very compact group, distinguished by their very characteristic dentition, and their completely plantigrade mode of progression. They have a very wide geographical range. On the other hand the *Procyonidæ*, though few in numbers and restricted to the warmer and temperate parts of the American continent, are structurally less closely connected, at least if the singular *Cercoleptes* is truly a member of this group. Except for the increased number of the molar teeth, which is the only definite character by which they can be separated from the *Mustelidæ*, I see no reason for considering the *Procyonidæ* more nearly allied to the *Ursidæ* than are the other families of the group, or for speaking of them as specially 'subursine.'

"*Ailurus* (an unfortunate name for an animal so essentially Arctoid) appears to me to be an isolated form. Its dentition, though remarkably modified in character, is numerically that of the *Procyonidæ*; but certain cranial peculiarities and its Asiatic habitat lead me to concur with Mr. Turner in placing it in a distinct group.

"The *Mustelidæ* constitute a large, widely diffused, and somewhat disjointed group, but exceedingly difficult to reduce into natural subfamilies. The most aberrant or specialized are the Otters, which, ending with *Enhydris*, run parallel to the Bears towards the Pinnipedia."

In his article "Mammalia" in the 'Encyclopædia Britannica,' Professor Flower arranges the Arctoidea as follows:—

ARCTOIDEA.

Family Mustelidæ.

I. Subfamily Lutrinæ....	*Lutra, Aonyx, Enhydra.*
II. Subfamily Melinæ....	*Mephitis, Arctonyx, Mydaus, Meles, Taxidea, Mellivora, Helictis, Ictonyx.*
III. Subfamily Mustelinæ..	*Galictis, Mustela, Putorius, Gulo.*
Family Procyonidæ.	*Procyon, Bassaris, Bassaricyon, Nasua, Cercoleptes.*
Family Ailuridæ.	*Ailurus.*
Family Ursidæ.	*Ailuropus, Ursus, Melursus.*

Before proceeding to express how far I completely concur in this arrangement, I will give my notes on the various genera, ending with what Professor Flower regards as the most aberrant type, and beginning with what is perhaps the most generalized form.

In beginning the Arctoid group, then, I take the genus *Procyon* as my type and standard of comparison.

The genus consists of two, if not three species, as correctly indicated by Dr. Sclater [1].

The oldest known form, that from North America, *P. lotor* [2], has

[1] See P. Z. S. 1875, p. 421.

[2] *Mapach quanhpecotli*, Hernandez, De Quad. Nov. Hisp. Folio I. Cap. 1. 1651.

Ursus cauda elongata, Linnæus, Syst. Nat. 1735, p. 35.

El Amerikanstet, Diur, Konigl. Vetenskaps Akad. Handl. 1747, p. 277, tab. ix.

Ursus lotor, Linnæus, Syst. Nat. (ed. 10) i. 1758, p. 48 (ed. 12) i. 1766, p. 70; Erxleben, Syst. Reg. Anim. 1777, p. 165; Schreber. Säug. iii. 1778, p. 521, pl. 143; Gmelin, Syst. Nat. i. 1788, p. 103; Harlan, F. A. 1825, p. 23.

Procyon lotor, Storr, Prod. Meth. Anim. 1780; Desmarest, Mammalogie, 1820, p. 168; Griffith's Cuvier, v. 1827, p. 114; Fischer's Synopsis, 1829, p. 147; Audubon and Bachman, vol. ii p. 47, pl. lxi.; Wagner's Supplement, Abth. ii. 1841, p. 154; Isid. Geof. St.-Hilaire, Zool. Voy. Venus, p. 125, pl. vi.; P. Gervais, Mammifères, vol. ii. (1855) p. 24; Allen, Bull. U. S. Geol. Survey, vol. ii. p. 325; Baird, Mamm. N. Amer. p. 207; Alston, Biologia, p. 69; Dr. Clinton Hart Merriam, Trans. of Linn. Soc. of N. York, Dec. 1882, vol. i. p. 71.

P. hernandezii, Wagler, Isis, 1831, p. 514; Baird, Mamm. N. Amer. p. 212, been incorrectly divided into species which have been named respectively (1) *P. hernandezii*, (2) *P. hernandezii* variety *mexicana*, and (3) *P. psora*. These names, however, appear to have been given to what are but a few of many varieties of this very variable species. It is the northern species, extending from Alaska southwards to Costa Rica, the more southern forms showing a marked increase in size and in intensity of colour. The other certain species, the synonymy of which was put right by Dr. Sclater [1], is *P. cancrivorus*, a South-American form, ranging from Colombia and Guiana, but which also reaches as far north as Panama. The Raccoons, which are yet further south, and extend through Brazil down to Paraguay, form not improbably a third distinct species of *Procyon*, distinguished (as Dr. Sclater has remarked) from *P. cancrivorus* by having darker feet, and so may be found to merit the designation *P. nigripes* which I would propose to bestow on it [2].

The latest description of the habits of the Raccoons is that given by Dr. Clinton Hart Merriam in his account, before referred to, of the fauna of the Adirondack region. He tells us that the Raccoons do not like the dense evergreen forests but more open woods; that they are the most strictly nocturnal of all Mammals except Bats and Flying Squirrels, and yet that they may sometimes be seen abroad on cloudy days. They like to play in shallow water, and overturn stones to search for crayfish. They gather mussels, and seek for fish which may be detained in shallow pools. They are good swimmers, but cannot dive in pursuit of prey. Though not arboreal, they are good climbers, making their homes in trees, but carrying on their business elsewhere; they do not pursue their prey to the tree-tops, as do the Martens, or gather nuts as do the Squirrels. They appear to make a fair defence, an "old Coon being a tough match for an average Dog;" they are very expert in breaking down the stalks of corn, and stripping the husks from the ear, using their fore paws as we do our hands. Though very sly, they are caught in traps. They are not swift runners, and if pursued take to a tree, when they may be readily killed. Though capable of being made pets of, they cannot be let loose with impunity, on account of their great curiosity, which leads them to find their way,

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and Report United States Mexican Boundary Survey, ii. Mammalia, p. 22; Frantzius, Arch. f. Naturg. xxxv. i. p. 291.

P. nivea, Gray, Mag. Nat. Hist. i. p. 580.

P. psora, Gray, *ibid.* x. (1842) p. 261.

Raccoon, Pennant, Hist. Quad. 1781, no. 178.

Raton, Buffon, Hist. Nat. viii. p. 327, pl. 43–46; F. Cuv. Mamm. ii.

Anatomy of:—Dr. H. Allen, Proc. Acad. N. S. Philad. 1882, p. 115; Dr. M. Watson, Proc. Roy. Soc. (1881), vol. 32. p. 272.

[1] See P. Z. S. 1875, p. 421.

[2] *Ursus cancrivorus*, Cuvier, Tabl. El. d'H. N. des Animaux, p. 113 (1798).

Procyon cancrivorus, Wagner, Suppl. Abth. ii. p. 160.

Raton Crabier, Buffon, Supplement vi. p. 236, pl. 32.

The above are the synonyms of *P. cancrivorus*. Those of *P. nigripes* are:—

Black-footed form, Sclater, P. Z. S. 1875, p. 421.

P. cancrivorus, Prince Maximilian von Neuwied, Beitr. ii. p. 301, and Rengger, Paraguay, p. 113, and Wiegm. Archiv, iii. i. p. 371.

if possible, into their master's house, and there examine everything especially in a pantry, where everything will be tasted by them; they are very fond of sweetmeats and preserves; they will remove covers from dishes and corks from bottles, and soon learn to unlatch doors, using their hands much as Monkeys do theirs.

They hibernate early, becoming active again in February or March, in the Adirondack region, where they generally breed early in April, having from four to six young at a birth, which remain with the mother about a year. They commonly live and travel about in small companies; they do not return to the same nest every morning, often going in various directions for several days. They live well in confinement, and sometimes breed.

Doubt has been thrown on the often asserted habit of the Raccoon of soaking his food in water. I have been careful, however, to ascertain from Mr. Bartlett that the animal really does so.

Procyon differs from all Æluroids in the length and mobility of the digits of the manus. Unlike all but *Cynogale, Rhinogale, Crossarchus,* and *Suricata,* there is no median groove to the nose and the upper lip is not medianly cleft. The soles are naked, from the wrist and the heels forwards. The claws are considerably curved and moderately sharp, but they are non-retractile.

The muffle is naked and large, and projects a little forwards above the nostrils, which are each crescentic, with the convexity downwards, and extend to the hinder border of the naked muffle. The whiskers on each side have 5 or 6 bristles grouped together, and there are four sets of such groups. There is also a tuft over the eye, one behind the angle of the jaw, and one under the middle of the chin.

The ears are moderately large, subovate, and rounded above, and are covered with hair except around the meatus.

The length from the nose to the root of the tail is about 22 inches, that of the tail (not counting the length of the hairs beyond the fleshy tip) is about 9 inches, and the length of each limb somewhat about 8 inches. There are 14 dorsal, 6 lumbar, 3 sacral, and from 16 to 20 caudal vertebræ. Taking the length of the spine[1] at 100, the proportional length of the neck is 16·9, of the dorsal vertebræ 41·9, of the lumbar region 28·7, of the sacrum 12·3, and of the tail 78·9; that of the whole fore limb is 74·5, of the humerus 27·4, of the radius 28·7, of the metacarpus 7·6, of the third phalanx of the third digit manus 2·7; of the whole pelvic limb 91·7, of the femur 32·3, of the tibia 33·9, of the metatarsus 10·6, and of the third phalanx of the third digit 2·7.

The relative length of the skull[2] is 28·2, of the palate 24·1, its breadth 6·5, the breadth of the zygomata 20·2, of the brain-case 12·8, and of the interorbital part behind the postorbital processes 6·8. The relative length of the lower dental series from the front of the canine to behind the last lower molar is 13·9. Taking the length of the skull from the basion to the front of the premaxilla at 100,

[1] From the front of the atlas to the hinder end of the sacrum.

[2] From the basion to the front of the premaxilla.

that of $\frac{P.4}{}$ is 7·7, of $\frac{M.1}{}$ 8·7, breadth of $\frac{M.1}{}$ 8·7, length of $\frac{M.2}{}$ is 5·8, of $\frac{}{M.1}$ 10·6, and of $\frac{}{M.2}$ 9·7. Comparing these proportions with those which exist in Æluroids and in the Dogs as exemplified by the Dingo, we find that the cervical region of the Raccoon, 16·9, is much less than that of the Dog, 26·2, a proportion only exceeded by *Cynogale* (26·6) and *Viverricula* (27·4) amongst the *Viverridæ*, and not equalled by any Feline form, though it is exceeded by the Hyænidæ (27·9–32·9). The Raccoon's neck is shorter that that of any Æluroid, being most nearly approached by *Arctictis*, in which it is 18·8 compared with the spine at 100.

Similarly the dorsal region of the Raccoon (41·9) exceeds that of most Æluroids, the only relatively longer dorsal regions being those of *Paradoxurus* (43·8), *Arctictis* (44·8), *Cynogale* (43·1), *Suricata* (45·4), *Galidictis* (42·2), and *Crocuta* (45·6); while it may be as small in *Genetta* as 34·4; that of the Dingo is 46·1—the longest of all.

The length of the lumbar region, which is relatively 28·7, is smaller than in any Cats (where it ranges from 32·5 to 37·4) and smaller than in any other Æluroids except *Viverricula* 23·2, *Arctictis* 27·2, *Cynogale* 25·0, *Crossarchus obscurus* 26·3, *Suricata* 25·8, and *Crocuta* 17·0, which is the smallest of all. In the Dingo it is 21·4.

The sacrum (12·3) is of exceptional length, being twice that of the Dingo (6·0), while in the Cats it ranges from 7·8 to 5·5. The shortest Æluroid sacrum is that of *Cynogale* (5·1), and the longest that of *Crossarchus obscurus*, 10·9.

The relative length of the pectoral limb, 74·5, greatly exceeds that of the Dingo (68·4). In the Cats it may range from 61 to 78. It exceeds that of every non-feline Æluroid, being most nearly approached by *Proteles*, where it is 74·0.

The length of the pelvic limb, relatively 91·7, greatly exceeds that of the Dingo, 78·5, and is only exceeded by that of some Cats, where it is 93·8. In non-feline Æluroids it ranges from 55·6 (*Viverra*) to 79·9 (*Suricata*) and 80·1 (*Galidictis*).

The relative length of the humerus, 27·4, is greater than that of the Dingo (23·8), and greater than that of any Æluroid except some Cats, where it may be 28·5. In *Viverra* it is but 16·3.

Similarly the radius, 28·7, is greater than that of the Dingo (24·6), or of any Æluroid, where it ranges from 27·4 (some Cats) down to 13·8 (*Viverricula*).

The longest (third) metacarpal, 7·6, is shorter than that of the Dingo (9·2), or of most Cats, where it may be 10·9, or of the Hyænidæ, where it may be (in *Proteles*) 12·5. On the other hand, it may be as short in the *Viverridæ* as 4·2, which is its relative length in *Cynogale*.

The ungual phalanx, 2·7, is about the proportion of that of the Dingo, which is 2·5; that of the relatively longest Viverrine being 4·5 (*Suricata*), and the shortest 13 (*Viverra* and *Genetta*).

The relative length of the skull from the basion to the premaxilla is 28·2, which exceeds that of the Dingo or any Dog or Cat and most Viverrines, being slightly exceeded by that of *Genetta, Herpestes, Cynictis, Hemigalidia,* and most of all by *Cynogale,* where it reaches 29·5.

The palate is relatively 24·1, which is more than double the average of the Feline palate's length, and much more than that of any Viverrine, the largest of which (*Herpestes*) is but 17·9. That of the Dingo is 13·8.

The relative breadth of the palate is 6·5, which is less than that of the Dingo (7·0) or of any Cat, and is hardly more than half that of *Crocuta,* while in *Suricata* it is 10·0. It is a little wider than that of *Viverra* or *Arctictis,* while that of *Eupleres* is only 3·9.

If we estimate the length from the basion[1] to the anterior edge of the premaxilla at 100, the length of the palate is 85·4, which greatly exceeds that of any Æluroid, where it ranges from 43·4 (some Cats) to 61 or 62 (some *Herpestes, Crossarchus,* and *Bdeogale*). In the Dingo it is 54·7.

The breadth of the palate thus estimated is 23·3, while in the non-feline Æluroids it varies from 16·8 (*Eupleres*) and 18·4 (*Arctictis*) to 49·3 (*Crocuta*). In the Cats it varies from 39·1 to 46·9, and in the Dingo it is 27·6, just what it is in *Viverra.*

The greatest breadth of the zygomata is 71·8, which exceeds that of the non-feline Æluroids except the Hyænas, where it may be 83·4. In the Cats it may be 89·3. In the Dingo it is 61·6.

The greatest breadth of the brain-case is 45·6. In the Æluroids it ranges from 27 (*Hyæna brunnea*) to 50·8 (*Suricata*) and 54·5 (some Cats). In the Dingo it is 34·9.

The narrowest interorbital or postorbital breadth is 24·2. In the Æluroids it may be only 15·6 (*Viverricula*) and 14·0 (*Cynogale*), or it may be 26·3 (*Suricata*) or 27·5 (*Galidia*). It is 22·0 in the Dingo.

The length, thus estimated, of the fourth upper premolar is 7·7. In the Æluroids it varies from 4·9 (*Arctogale*) to 16·4 (*Crocuta*). In *Viverra* it is 11·1, and in the Dingo it is 10·3.

The length of the first upper true molar is 8·7. In the Æluroids it varies from 1·3 (*Crocuta*) to 5·6 (*Hemigalea*). In *Viverra* it is 5·2, and in the Dingo it is 6·9.

The breadth of the same tooth is also 8·7, while in the Æluroids it ranges from 1·7 (*Crocuta*) to 10·5 (*Suricata*). In *Viverra* it is 9·7, and in the Dingo it is 9·4.

The relative length of the second upper true molar is 5·8. In the Æluroids it may be only 1·2 as in *Genetta,* or it may reach 5·2 in *Cynogale.* In *Viverra* it is 2·9, and in the Dingo it is 3·1.

The proportion borne by the pelvic limb (femur, tibia, and pes) to the entire pectoral limb taken at 100, is 123·1. In the non-feline Æluroids it ranges from 94·4 (*Crocuta*) to 136·4 (*Viverricula*). In the Cats it may be 113·1 or 136·4 (the Eyra), the average being 119·4. In *Viverra* it is 127·9, and in the Dingo it is 114·6.

Compared with other Arctoids, *Procyon* has the relatively longest

[1] *I. e.* front margin of foramen magnum.

limbs, compared with the length of the spine. It has also the longest radius, tibia, metacarpals and metatarsals, and palate.

In the skull the alisphenoid joins the parietal [1], but the ascending process of the premaxilla does not attain the descending process of the frontal [2]. The palatine bone joins the orbito-sphenoid, and the postaxial process of the premaxilla is separated mostly, if not always, from the preaxially extending process of the frontal, by the junction of the nasal with the premaxilla. The malar joins, at least sometimes [3], the lachrymal bone, and forms part of the margin of the infraorbital foramen. The maxillary bone forms a floor to the orbit much as it does in *Canis*, and therefore to a less extent than in *Felis*. The palate extends back much beyond the last molars. The postorbital processes are very small; the subangular process of the mandible is rudimentary. The form of the *basis cranii* has been described and figured by Professor Flower (P. Z. S. 1869, p. 9, fig. 3, p. 10).

The scapula has a remarkably large supra-spinatus fossa, and its metacromion is, as a rule, developed much as in the Civet. The humerus is perforated by a small supra-condyloid canal. The femur has the upper part of its posterior surface somewhat flattened. The ungual phalanges are somewhat intermediate in form between those of the Civet and those of the Dog.

Molar formula = P. $\frac{4}{4}$, M. $\frac{2}{2}$.

The teeth remind us rather of those of some of the Paradoxures than those of any other Æluroids or Cynoids, but the non-sectorial character of the Paradoxurine teeth is here carried still further. The last, or fourth, upper premolar and the two upper molars have each three roots. The second and third upper premolars have each two roots. All the lower grinders except the first premolar have also each two roots. The fourth upper premolar is not at all sectorial in character. It has three external cusps (the middle one of which is much the largest) continuous with a small external cingulum, and two internal cusps placed opposite the interspaces of the three external cusps. The first upper molar differs from that of every Æluroid or Cynoid in that it is no broader anteriorly than it is posteriorly. It has four large cusps, whereof the two outer ones are of equal size and rather more distant from the external cingulum than in the fourth upper premolar. There is also a minute cusp developed from an internal cingulum, and situated inside the postero-internal cusp. The second upper molar has four cusps. Two of these are external, the anterior one of the two being the larger. Of the

[1] In this matter *Procyon* agrees with *Felis, Viverra, Paradoxurus, Arctictis, Cynogale, Herpestes, Suricata, Hyæna,* and *Crocuta,* as well as many forms of *Canis,* though I find that sometimes in *Canis* the squamosal joins the frontal, as in the Wolf and Kit Fox.

[2] I have noticed this junction to occur in *Hyæna,* except *H. brunnea, Crocuta, Herpestes, Arctictis,* sometimes in *Felis,* and most markedly so in *Suricata,* where the summit of either premaxilla ascends a little the inner side of the descending process of the frontal. In *Viverra, Paradoxurus, Cynogale,* and generally in *Felis,* the premaxilla and frontals do not meet.

[3] Cuvier, Leçons d'Anat. Comp. vol. ii.

internal the hinder one is very small. The fourth lower premolar has one principal cusp, with a minute one at its base in front, and two considerable-sized ones attached to it behind. These accessory cusps are larger than they are in the Dogs, and especially the one behind the principal cusp is more equal to the latter than it is in them. The first inferior true molar is not at all sectorial. It has two inner and two outer cusps and another (fifth) antero-internal cusp. The hindermost internal cusp may be subdivided into two smaller ones. Although this tooth is much like the corresponding one of the Civet, only the antero-external and the antero-internal cusps do not preponderate in height as in that animal. The two hinder cusps (one internal, the other external) correspond with the "heel" of the dog's tooth, while the more anterior part corresponds to the whole of the crown of the corresponding tooth of *Felis*. This "heel" in *Procyon* forms nearly half the tooth, and rises nearly as high as does the more anterior portion. It is very like the same tooth as it may be seen in *Paradoxurus*.

The second lower true molar is quinquecuspidate like the first, only the azygos cusp is placed behind, instead of in front of, the two pairs. It is an exaggeration of the same tooth as found in *Paradoxurus*, but is more equal in size to the tooth in front of it.

The muscles have been described by Dr. Harrison Allen [1]. The tongue is medially grooved at its anterior half and provided with a lytta which is relatively a little longer than in the Cats. The tongue is covered with small conical papillæ, and fungiform papillæ are scattered amongst them. The flattened papillæ are moderately developed. There are ten, twelve, or fourteen rather small circumvallate papillæ in two rows forming an acute angle open forwards, with five, six, or seven in either row.

The descending aorta, after giving off in front its inferior mesenteric artery, gives off, on either side, an external iliac artery, and a little beyond divides into two internal iliacs, from the bifurcation of which a small mid sacral artery continues on to the tail. The arch of the aorta gives off one great innominate artery, one left subclavian.

The lungs are as usual in the Carnivora. The kidney has a single mamilla. The intestine in one instance presented a singular and very exceptional and elongated dilatation between the small and large intestine. This was in no wise in the form of a cæcum, but merely a dilatation of part of the course of the intestine.

The liver has its right half, rather, or very much, the larger. The left central lobe is simple and rather, or very, small. The bladder appears on the diaphragmatic aspect, through a perforation or a notch. The caudate lobe is moderate, and the Spigelian small. That part of the right central lobe which is on the left side of the bladder, is deeply furrowed. It has the pair of simple anal glands usual in the Carnivora.

The bone of the penis is very large; and in one instance the vasa deferentia opened upon the dorsal aspect of the urethra.

[1] See Proc. Acad. Nat. Sc. Philadelphia, 1882, p. 115.

The female generative organs and placentation have been described by Dr. M. Watson[1]. According to this observer, the placenta forms a complete ring, but at the widest part, opposite the back of the fœtus, he found a spot similar to that figured by Daubenton[2] in the placenta of *Martes domestica*, and described by Bischoff in that of *Lutra vulgaris*[3], *Mustela foina*, and *Mustela martes*[4], where the substance of the placenta was very defective. *Procyon* agrees with *Canis* and differs from *Felis*, "in the absence of a continuous layer of *decidua serotina* from the uterine surface of the detached placenta." It differs from all Carnivora yet known in having the fœtus provided with an extra article, or *epitrichium*; a structure found in *Cholœpus hoffmanni*, *Bradypus*, *Myrmecophaga*, *Dicotyles*, *Sus*, and *Equus*. It also agrees with *Cholœpus hoffmanni* in the possession[5] of certain peculiar placental vessels not hitherto found in any other animals. Dr. Watson finally records that it "differs from every other Carnivore, the fœtus of which has been hitherto examined, in the non-possession of an umbilical vesicle."

The brain[6] shows a parietal gyrus which does not bifurcate posteriorly as it does in the *Cynoidea*. The Sylvian gyrus has its anterior limb much smaller than its posterior limb. The parietal gyrus is large, expanding anteriorly, becoming considerably contorted, and sometimes communicating, by a bridge of convolution, with the sagittal gyrus. The sagittal gyrus is very large, and becomes complicated anteriorly. In *P. cancrivorus* there are two or three bridging convolutions on each side, between the parietal and the sagittal gyri. The hippocampal gyrus continues upwards into the sagittal gyrus behind the cranial sulcus[7], the calloso-marginal sulcus not being continued forwards into the latter. The crucial sulcus is very large and distinct, and sends forwards and inwards a small precrucial sulcus, thus defining, with its fellow of the opposite side, a conspicuous diamond-shaped patch of brain-substance, which has been called the "Ursine lozenge."

The genus *Nasua* comprises two species, *N. narica*[8] and *N.*

[1] See Proc. Royal Soc. 1881, vol. xxxii. p. 272.
[2] Buffon, Hist. Nat. vol. vii. pl. xx.
[3] Sitzungsb. Akad. Wissensch. München, 11 März, 1865.
[4] Ibid. 19 Mai, 1865.
[5] See Prof. Turner's paper, Trans. Roy. Soc. Edin. vol. xxvii. p. 79.
[6] See a paper entitled "Notes on the Cerebral Convolutions of the Carnivora," in the Journal of the Linnean Society, vol. xix. (1885), p. 10.
[7] As in the *Felidæ*.
[8] *Nasua*, Storr, Prod. Meth. Mamm. p. 35 (1780).
Caoti, Lacépède, Mém. de l'Hist. Nat. iii. p. 492 (1801).
Viverra narica, Linn. Syst. Nat. i. p. 64 (1766).
Coati mundi, Brisson, Règne Anim. 1756, p. 262.
Coati brun, Buffon, viii. 1760, p. 358, pl. 48.
Nasua narica, Allen, Bull. U. S. Geol. Survey, v. p. 162.
Nasua leucorhynchus, Tschudi, Fauna Peru, p. 100 (1846); Frantzius, Arch. f. Naturg. xxxi. i. p. 292; Hensel, Abh. Akad. Berlin, 1872, p. 65.
N. fusca, Tomes, P. Z. S. 1861, p. 280.
N. solitaria, var. *mexicana*, Weinland, Zool. Garten, 1860, p. 191, pl. 1.
N. naria, Alston, Biologia Centrali-Americana, Mammals, 1879, p. 74.

rufa[1], and is represented by one or other of them from Texas to Paraguay.

It inhabits the mountain tracts of Costa Rica at a height of from 6000 to 7000 feet above the sea. Belt[2] observed it pursuing large Iguanas, but they, when surprised asleep, usually dropped and escaped to another tree; yet the attempt would be continued again and again. He noticed it hunting in large bands, some individuals hunting over the ground and others in the trees, so that the prey had little chance of escape. In Guatemala it is one of the commonest mammals, ranging from the woods of the coast up to forests at a height of 9000 feet. The Coatis are very easily tamed, and are often seen in Spanish American houses, chained to one of the pillars of the corridor surrounding the courtyard. They are very variable in colour apart from differences of age and sex.

The claws are of considerable size and much longer and stouter than those of *Procyon*. The digits also are much more united by skin, which extends down them as far as the penultimate joint of each.

The nose is produced into a short proboscis, the end of which is naked, and has its upper margin much the most projecting. There is no median groove to either nose or lip, but there is a lateral notch in the margin of either nostril. The snout is surrounded by the usual nasal cartilages, much enlarged, and appearing to be more or less fused together. It has a longer, slender, median dorsal cartilage.

The ears are very hairy within as well as without. There is a very small tragus and a small bifurcating antitragus. The vertical ridge, ascending from the tragus to the helix, flattens out above. The anthelix is prominent and sharply defined; the prominence below it is much less so.

The palmar and plantar surfaces are naked. Six mammæ are described as existing.

There are 14 dorsal, 6 lumbar, and 3 sacral vertebræ as in *Procyon*, and from 19 to 23 caudal vertebræ. The dimensions are given in the tables annexed to this paper, and also the proportions, of which there need here be mentioned only the fact that the relative length of the pelvic limb to the spine is greater than in any

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Quauhpecotl, Hernandez, De Quad. N. Hisp. Fol. 6, cap. 17.

Pisoti of Spanish Americans.

Nose and edge of upper lip white; face and cheeks dark brown; fur long and soft, the long hairs of dorsal surface tipped with rufous, fulvous, or whitish; tail of same colour as back, or with half rings on lower surface of basal half.

Range from Texas to Panama, perhaps to Colombia (Tschudi's specimen said to be Brazilian was probably not so).

[1] *Coati*, Marcgrave, Hist. Nat. Brazil, 1648, p. 228; Azara, Hist. Nat. Paraguay, i. 1802, p. 293.

Coati noirâtre, Buffon, viii. 1760, p. 358, pl. 47

Coati à queue annelé, Brisson, Règne Anim. 1756, p. 263.

Viverra nasua, Linn. Syst. Nat. i. 1766, p. 64.

Fur generally short and harsh; long hairs of dorsal surface usually black-tipped; ears rather large and pointed; tail conspicuously annulated with 7–9 broad fulvous or rufous rings alternating with black ones.

Brazil; Paraguay.

[2] Naturalist in Nicaragua, p. 339.

other Arctoid except *Procyon,* where it is still longer and where the radius is at its maximum of relative length in that group. The length of the skull compared with that of the spine is greater than in any other Arctoid except *Melursus,* while the relative breadth of the skull behind the postorbital processes is at its maximum. When compared with the total length of the skull, the palate of *Nasua* is lower than in any other Arctoid except *Procyon,* and the length of the pelvic limb, compared to that of the pectoral one, only attains the same proportion in *Lutra.*

As to the skull, the form of the auditory bulla and parts adjacent has been described by Professor Flower [1]. The muzzle is longer, and more upturned towards the apex than in the skull of *Procyon*; the frontal region also is more convex and swollen; the mastoid process [2] is less prominent, the paroccipital process less prominent and more applied to the bulla. The bulla is more inflated, the carotid foramen situated more forwards, and the condyloid foramen is smaller and less conspicuous.

The palate is not only much prolonged behind the last molars, but remains very broad there. The maxilla forms, indeed, but a very small bony floor to the orbit. The mandible has no subangular process, and the angle is very small and less produced and pressed upwards than in *Procyon.* Sir Richard Owen remarks (Anat. of Vertebrates, vol. ii. p. 501) that in *Nasua* "the olfactory chamber, with the superior turbinals, extends above the whole rhinencephalic fossa, and forms in part the frontal elevation of the cranial contour."

The ulna is much broader and less slender than in *Procyon,* and the fibula is more divaricated from the tibia. The pollex and hallux are also rather longer in proportion to the longest digits.

Molar formula $= \text{P.}\ \frac{4}{4},\ \text{M.}\ \frac{2}{2}$.

The first premolar, both above and below, has two roots. Compared with the teeth of *Procyon,* those of *Nasua* have the following characters:—The fourth upper premolar has the postero-inner and principal outer cusps less developed. In the first upper molar, the internal cingulum is obsolete. The second upper molar is tricuspid instead of quadricuspid, the postero-internal cusp being generally obsolete.

In the first lower true molar the antero-internal cusp may be wanting, and the postero-internal may be smaller than in *Procyon.* The second inferior molar may be without the fifth or median and hindmost cusp of the Raccoon.

In the milk dentition, the first upper deciduous molar is a simple conical tooth. The second one is similar, save that it has a small posterior cusp. The third upper molar is unlike any other

[1] *Loc. cit.* p. 9.

[2] The mastoid process is almost, if not quite, as prominent in the Æluroid *Nandinia* (see P. Z. S. 1882, p. 170) as it is in *Nasua.* In *Nandinia* it is also as prominent as it is in *Canis, Bassaris, Ailurus, Galictis, Ictonyx,* or *Helictis,* and it is more prominent than it is in *Mydaus, Mustela,* or *Putorius.* On the contrary, it is not so prominent in *Nandinia* as it is in *Procyon, Meles, Taxidea, Arctonyx, Gulo, Mephitis, Conepatus, Mellivora, Lutra,* or *Enhydra.*

tooth I have seen, approaching nearest to the first upper molar of *Procyon*, and the fourth upper deciduous molar of *Cynogale*. The tooth is broadest behind. It has one principal external cusp with an accessory one in front of it, and another behind it. There is also a strongly marked internal cingulum. The fourth deciduous upper molar is like the first upper true molar. The fourth lower deciduous molar is like the first lower true molar, but with a larger keel, so that its form is intermediate between that of the first and that of the second lower true molars. The submaxillary gland is small, but the parotid is exceedingly small.

The tongue has a well-developed lytta. All the papillæ are small except the flattened papillæ, which are a little larger than in *Nandinia*. The circumvallate papillæ are very small, in two rows forming an acute angle open forwards.

The liver resembles that of *Procyon*, except that that part of the right central lobe which is on the left side of the gall-bladder is smaller and not furrowed, and that the caudate lobe is larger.

The two anal glands are very peculiar. Each has four small pouches, which recede from its fundus, and are surrounded by glandular structure.

The brain[1] shows but a very indistinctly marked Ursine lozenge, and the calloso-marginal sulcus does not run on into the cranial sulcus. The sagittal gyrus is more complicated than in *Procyon*.

Cercoleptes[2].—The Kinkajou is found from Central Mexico down to the Rio Negro of Brazil. Messrs. Godman and Salvin remark that it is not rare in Guatemala, and ranges up to 4000 or 5000 feet. One, which was met with there, feeding on fruit in a tree overhanging the river, and which was wounded, fell into the river, the stream of which it swam in without difficulty. It is an animal easily tamed, living in captivity on oranges and bananas, which it greedily eats. It is not umcommonly found in holes of trees, where it lies concealed during the day, issuing forth at night in pursuit of small animals and birds. Its thick, somewhat woolly fur is much valued, and skins are brought to the market. Dampier in his 'Voyages' (vol. ii. p. 59) observes:—"The skin is covered with short, fine, yellowish hair. The flesh of it is good, sweet, and wholesome meat. We commonly skin and roast it, and then we call it Pig, and I think it eats as well."

In this animal we again meet with the median nasal groove so generally present in Æluroids; the head is broad and round, with a short muzzle, the ears short and rounded. The body is long with short limbs, very long and prehensile tail, and the claws very long

[1] See the paper on the Convolutions before referred to, p. 11, fig. 1.

[2] *Viverra caudivolvulus*, Pallas in Schreber's Säugeth. iii. p. 453, pl. 125 B.
Kinkajou, Buffon, Supp. iii. p. 245, tab. 50, 51.
Potos caudivolvulus, Desm. Mamm. p. 171.
Cercoleptes caudivolvulus, Illig. Prodr. p. 127; Schomburgk, Ann. Nat. Hist. 1840, p. 29; Wagner, Supp. ii. p. 170; Owen, P. Z. S. 1835, p. 119; Tomes, P. Z. S. 1861, p. 280; Biologia, p. 76; De Blainville, Ostéographie, *Subursus*; Gervais, Mam. vol. ii. p. 23.

and strong, sharp-pointed and much curved. The palmar and plantar surfaces are naked.

There are 14 dorsal, 6 lumbar, 3 sacral, and 26 caudal vertebræ. The dorsal region is relatively shorter, and the lumbar and tail longer than in any other Arctoid. It has the relatively shortest first lower true molar. There are small rudimentary clavicles. The inner condyles of the humerus may or may not be perforated [1].

To the characters already pointed out by Professor Flower [2] may be added the conspicuousness of the stylo-mastoid foramen and the flattened, broadened-out condition of the basis cranii external to it. The palate is not prolonged as in *Procyon* and *Nasua*, behind the molars, a peculiar pointed process projecting backwards from its hinder edge behind each last molar.

Strong postorbital processes project both from the frontals and the molars. The alisphenoid is widely separated from the parietal by the wide junction between the squamosal and the frontal. The palatine also joins the orbitosphenoid. There is a very large infraorbital foramen. The palate is very slightly arched, with an antero-posterior convexity. The lachrymal foramen is placed very low in the orbit.

The mandible differs greatly in shape from that of any other Carnivore, and much resembles that of the Lemuroid, *Microrhynchus*. The inferior margin of its horizontal ramus is concave; the symphysis is very long, and the postero-inferior part of the mandible is greatly expanded, the angle projecting downwards as well as backwards. There is no subangular process. The coronoid process is much prolonged upwards, and may sometimes incline a little forwards rather than backwards.

Comparing this most arboreal Arctoid with *Arctictis*, the most arboreal Æluroid, one is struck with the similarity which exists in the proportional length of the limbs, and in the presence of the chevron bones beneath the tail, of which there are here seven.

The ultimate phalanges are more elongated and curved than in *Procyon* and *Nasua*; but there are no large bony plates to sheath the bases of the claws as in the Cats, nor have the penultimate phalanges the feline lateral excavation.

Molar formula $= \text{P.}\ \frac{3}{3}, \text{M.}\ \frac{2}{2}$.

The molars are very simple in structure, with low flat crowns, though essentially like those of the two preceding genera. The fourth upper premolar and first upper molar are formed on the same type as those of *Procyon*, but the cusps are much less developed. The second lower molar is rather smaller in comparison with the first one than is the case in *Nasua* and *Procyon*. The other lower molars are formed on the same type as those of the two last-mentioned genera, but are more flattened on the surface and less tuberculate.

[1] Sir Richard Owen (in his Anat. of Vertebrates, vol. ii. p. 509) says:—"I have seen the condyle notched in the right, and perforated in the left humerus."

[2] P. Z. S. 1869, pp. 9, 10.

For an account of the myology of *Cercoleptes*, see J. Beswick Perrin, Proc. Zool. Soc. 1871, p. 547.

The tongue is long, narrow, and exceedingly extensible. The circumvallate papillæ are as in *Nasua*. The fungiform papillæ are scattered over the surface generally. There is a rounded patch of somewhat elongated conical papillæ in the middle of the dorsum. There are no marked flattened papillæ. The lytta is very elongated and stout.

The liver is very like that of *Nasua*, but the cystic notch is deeper.

There are the two normal anal glands.

The lungs present four lobes on the right side, and two on the left.

The thyroid cartilage is, as in *Canis*, much deeper in front medianly than in Æluroids. It is indeed deeper or narrower there than elsewhere, whereas in all the Æluroids I have examined it is narrower in the middle than anywhere else.

The external ear has no pouch. The conch is rather smooth. There is a tragus and an antitragus and a ridge-like supratragus (the front end of which is most prominent), with a vertical ridge in front of it, which ends superiorly within the anterior margin of the conch.

The brain is short and rounded. The Ursine lozenge is not strongly defined. The cranial and calloso-marginal sulci join [1].

Ailurus [2].—This, the first Old-World Arctoid we have to consider, is found in the South-eastern Himalayas amongst rocks and trees at an elevation of from 7000 to 12,000 feet. It feeds mainly on fruits and other vegetable matters. The Panda has a broad, short face, small eyes, large, erect, pointed ears, and a naked end to the muzzle. The limbs are stout, and the locomotion is plantigrade, although the palmar and plantar surfaces are almost entirely hairy. The claws are large but blunt. and not at all retractile.

The vertebræ are 14 dorsal, 6 lumbar, 3 sacral, and 18 caudal. The length of the second inferior true molar, compared with that of the skull, is greater than in any other Arctoid.

To the cranial characters already described by Professor Flower, the following notes may be added :—Though the muzzle is so short, yet it is upturned distad in a way which recalls the form of the skull of *Nasua*. The zygomata are more arched, both upwards and outwards, than in the hitherto described genera, but most resembling, of the three, the condition existing in *Procyon*. The infraorbital foramen is large. The palate is curiously arched, being strongly

[1] See P. Z. S. 1869, p. 13.

[2] *Ailurus fulgens*, F. Cuv. Mamm. iii. 50 livr.; (*Panda*) Hardwicke, Linn. Trans. xv. p. 161, pl. 2; Wagner's Supp. vol. ii. p. 177; Gervais, Mamm. ii. p. 23; Brian Hodgson, Journ. Asiat. Soc. Bengal, vol. xvi. p. 1113 (1847), where an account of the animal's habits is given; Gray, P. Z. S. 1864, p. 708 (with figures of skull and palate); P. Z. S. 1869, pp. 278, 408–507, pl. xli.; Flower, P. Z. S. 1870, p. 752 (anatomy, with woodcuts); De Blainville, Ostéographie, *Subursus*, pl. vii.; Bartlett, on Habits in Captivity, P. Z. S. 1870, p. 769.

convex antero-posteriorly. It is greatly narrowed behind the last molars, and hardly more relatively prolonged there than in *Cercoleptes*. The sagittal ridge is rather strong.

The mandible shows a coronoid process, which is loftier and arches more over backwards than that of any of the preceding genera. The inferior margin of the horizontal ramus is convex. There is no subangular process. The angle is very small, upturned, and little produced.

The phalanges are very broad, and the ultimate ones have, like those of the Cats, large bony sheaths to shelter the bases of the claws. Nevertheless the penultimate phalanges are not laterally excavated.

Molar formula $= \text{P.}\ \frac{3}{4}, \text{M.}\ \frac{2}{2}$.

The incisors are singularly small. The premolars and molars are very interesting to compare with those of *Procyon*. They are formed on the same type as are the latter, but present a wonderful exaggeration of their characters, and are exceptionally broad and multicuspidate. The second upper premolar is a rather large tooth with minute cusps on either side of the base of its great outer cusp, and it has an internal cingulum. The third upper premolar has three outer cusps which are continuous with an external cingulum. There are two internal cusps, whereof the anterior is much the smaller, and another minute cusp is developed from the internal cingulum. The fourth upper premolar has three outer cusps rather distinct from the external cingulum, two subequal internal cusps, and another good-sized cusp developed from the internal cingulum. The first upper true molar has two external and two internal principal cusps, a strong internal cingulum, and an external cingulum with two supplementary cusps and two vertical ridges. The supplementary cusps are placed one in front of and the other behind the antero-external principal cusp. The two vertical ridges descend and lose themselves upon the outer surface of the postero-external principal cusp. The second upper true molar has four main cusps with three external small ones developed from the external cingulum, and one internal cusp developed from the internal cingulum. The first lower premolar is minute and deciduous. The second is like a diminished fourth inferior premolar of *Procyon*, with the minute supplementary hinder cusps added to it. The third is still more like the fourth lower premolar of *Procyon*. The fourth is also like it, only that the first cusp is developed almost to an equality with the second, while the third and fourth cusps of the *Procyon* tooth are represented by a single cusp, which is also almost as large as the second cusp. There is also a median internal cusp. The first lower true molar is like the corresponding tooth of *Procyon*, but with the hindmost internal cusp represented by two small cusps, as it sometimes is in *Procyon*. The second lower true molar is like the first, except that the antero-internal cusp (*i. e.* the most anterior cusp of all) of the latter has disappeared, while an additional, median, large cusp appears at the hindermost part of the tooth.

The anatomy of the animal having been so fully described by Professor Flower, it is sufficient here to remark shortly that the tongue is pointed, covered with rather small conical papillæ, small fungiform papillæ being generally scattered over the surface. The flattened papillæ are inconspicuous, and the circumvallate papillæ are in two rows of about four each, forming an acute angle open forwards.

The liver has much the same general form as that of *Nasua*, but the right and left halves are pretty equal, and the caudate lobe is still larger.

The lungs have four right and two left lobes.

The heart is rounded, and the great vessels are given off as in the Genet.

The thyoid cartilage is Æluroid and not Cynoid in shape.

The os penis is much smaller than it is in *Procyon* and *Nasua*.

The anal glands are a single pair as usual.

The brain[1] shows but a feebly marked Ursine lozenge. The hippocampal and sagittal gyri join behind the crucial sulcus.

Ailuropus[2].—This very singular genus, comprising only one very rare species, is the giant of that Arctoid group of which the Raccoon is the type, being but a little smaller than the Brown Bear of the Pyrenees. From muzzle to tail-root it measures 1·50 m., and it stands ·66 m. high. It feeds on bamboo-roots and other vegetal substances. It inhabits the most inaccessible mountains of Eastern Thibet, from which it descends only to commit depredations in the plains. It is very bulky, with a short and exceedingly broad head, but the nose is small.

The tail is so short as to be hardly visible. The feet are short and rounded, and, as in the Panda, the palmar and plantar surfaces are hairy, and the locomotion is not fully plantigrade. The fur is very thick, like that of a Bear.

The skull is remarkable for its great sagittal crest, the shortness of the muzzle, and the enormous development of the zygomata, the extreme breadth between which is 89·3 compared with the length of the skull taken at a hundred. It is therefore greater than that of any other Carnivore, being most nearly approached by *Ailurus*, where it is 83·5, and *Hyæna brunnea*, where it is 83·4, and the relative length of the second upper true molar also here attains its maximum. The breadth between the orbits behind the postorbital processes (which are almost obsolete in both the frontal and the malar) is less than in any of the terrestrial Carnivores, being only 14·8. That of

[1] See *l. c.* p. 12, and also P. Z. S. 1870, pp. 755–757, figs. 1, 2, 3, where this brain has been described and figured by Professor Flower.

[2] *Ursus melanoleucus*, A. David, Nouvelles Archiv. du Mus. t. v. Bulletin, p. 13.

Ailuropa melanoleucus, Alph. Milne-Edwards, Ann. des Sc. Nat. sér. 5, 1870, t. xiii. art. no. 10.

Ailuropus melanoleucus, A. Milne-Edwards, Nouvelles Archiv. du Mus. 1872, t. vii. Bulletin, p. 92, and 'Recherches pour servir à l'histoire Naturelle des Mammifères' (1868–1874), tome i. (text) p. 321, tome ii. (atlas) plates 50–56.

Cynogale is 14·0, while in *Lutra* the relative dimension may descend to 10·5. The snout is upturned towards its tip, and the interorbital surface is swollen and convex, thus recalling to mind the form of the skull of *Ailurus.* The infraorbital foramen is very low down and distant from the orbital margin, and the maxilla forms but a very small bony floor to the orbit. The palate does not project back quite so far as the posterior ends of the last upper molars. The mastoid process is very large and lamellar. The glenoid fossa is enormously broad. The condyloid foramina are very small. The bulla is moderately swollen, as in *Ailurus*, but very small relatively. There is a glenoid foramen, more or less hidden, but no alisphenoid canal. The mandible is very like that of *Ailurus*, with a very high coronoid process, a small angle pressed upwards, and no subangular process.

Molar formula, P. $\frac{4}{3}$, M. $\frac{2}{3}$.

The premolars are two-rooted, except the first upper premolar, which is very minute. The second has three lobes, whereof the median is very much the largest. The third has three external and three internal cusps, with a sixth very small accessory cusp between the antero-internal and the antero-external cusps. The fourth premolar has three external and three internal cusps, with a minute accessory cusp between the two internal cusps and an internal cingulum. The first upper true molar, which has a square grinding-surface, has two great external cusps, with a rudimentary tubercle in front of the more anterior of the two; also two large internal cusps and a very distinct internal cingulum. The second upper true molar is a most exceptionally formed tooth, having a grinding-surface covered with a great many minute prominences at its hinder part, with two distinct and large external tubercles, and at least one internal tubercle at its anterior part, the whole being bordered within by a very distinct internal cingulum.

The three inferior premolars increase in size equally and pretty regularly from before backwards, and the crown of each has three tubercles, the median tubercle becoming less predominant as the accessory tubercle increases in size from the first to the third premolar, those of the third being nearly equal-sized.

The first lower true molar is like the corresponding tooth of *Ailurus*, with slight superadded complications, with a large antero-internal cusp, and only a single undivided postero-internal cusp. The second molar is only quadricuspid, with no posterior tubercle or talon, because there is here a third molar. This last tooth is a large, flattened, rounded tooth, with an irregular surface. The brain bears a large ursine lozenge[1].

Bassaris[2].—This is a small American Arctoid genus, of slender form, with somewhat digitigrade feet and slender muzzle, but which

[1] See the paper on the convolutions before referred to, p. 12.

[2] There are two species—*B. astuta* from Ohio, Oregon, Texas, California, North Mexico, and Vera Cruz; and *B. sumichrasti*, from the mountains of Mexico, Central America, and Costa Rica. See Biol. Centr. Am. Mammalia, p. 71, pl. vii.; Abh. Ak. Berlin, 1827, p. 119; (Wagler,) Isis, 1831, pp. 423 and 513; Water-

is nevertheless allied to *Procyon*. Its two species range from the southern parts of the United States to Central America. The soles of the feet are hairy.

There are 13 dorsal, 7 lumbar, 3 sacral, and more than 23 caudal vertebræ. In addition to the cranial characters pointed out by Prof. Flower[1], which are very fully given, there is nothing which need here be noted beyond the relatively large size of the infra-orbital foramen and of the postorbital processes of the frontals. The palate hardly extends beyond the last molars, but the mesopterygoid fossa is very long.

Molar formula $=$ P. $\frac{4}{4}$, M. $\frac{2}{2}$.

The teeth are like those of *Procyon*, except that the fourth upper premolar narrows posteriorly. It has three external cusps (whereof the middle cusp is much the largest), and two internal cusps, the posterior one of which is much the smaller. Thus, but for the second internal cusp, it would be like the corresponding tooth of *Paradoxurus*. It is a really sectorial tooth. The first upper molar is like the same tooth of *Procyon*, except that it is relatively broader;

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house, P. Z. S. 1839, p. 137, note; Flower, P. Z. S. 1869, pp. 31–34; Lichtenstein's Darst. neu. Säug. pl. 43; Charlesworth, P. Z. S. 1841, p. 60; De Saussure, Rev. et Mag. de Zool. 1860, p. 7, pl. i.; Peters, Monats. Berlin, 1874, p. 704, pls. i. & ii.; Baird, Mammals of N. Amer. p. 147, and Zool. of Mexican Boundary, part ii., Mammals, p. 17, pl. 14. figs. 2 *a–e*; Allen, Bull. U. S. Geol. Survey, vol. v. p. 336; Audubon, ii. p. 314, fig. 98; Paul Gervais, Voyage de la 'Bonite' (1841), and Mammifères, vol. ii. p. 42; De Blainville, Ostéographie, *Mustela*; Turner, P. Z. S. 1848, p. 81; Wagner, Säug. Suppl. vol. ii. p. 277.

This animal, called Cacomistle, is said to have somewhat the look of a Fox and the ringed tail of the Raccoon, and a body much like the Vison's. The fur soft, with long hairs interspersed. Ears well developed, erect, and pointed, almost naked externally, but clothed with short hairs within. The posterior edge is split. The whiskers are long, eyes rather large, and tail bushy, depressed, ringed black and white. Feet with naked pads, but the rest of the under surface hairy. Claws short, but partially retractile. The animal is about the size of a Cat, being 17½ inches from the nose to the root of the tail, with the tail 16 inches long, exclusive of the hairs at its tip. It is of a dull brownish yellow mixed with grey (with long black hairs interspersed) above and whitish beneath. The tips of the ears, a spot above and below the eye, and the upper lip are yellowish white. The tail has 7 or 8 brownish-black rings (which become wider antero-posteriorly), with a black tip. It is called the "Cat-Squirrel" by the Texans. It lives amongst rocks and trees. It is not rare, but is seldom seen, being nocturnal. It is easily tamed and even domesticated, and makes a mild and playful pet; it is useful for destroying mice and rats, but is a very destructive animal to poultry, and is naturally bold. The female specimen which was killed is said to have fought furiously with claws and teeth, and shown no disposition to fly. Four or five young adhered to her teats so firmly that it required considerable force to detach them; though when they were removed the mother had been dead several hours, they showed no signs of discomfort. It prefers to inhabit woods traversed by watercourses. It feeds on small quadrupeds and birds, and makes its nest in the trunks of trees, in holes from 12 to 18 inches deep, which are the result of natural decay. It is said, however, always to remove the bark round the mouth of the hole it inhabits, and when no such marks are to be detected, it is a sign that the animal has abandoned that dwelling. The tail is carried bent over the back, much in the fashion of a Squirrel. It has three or four young at a birth.

[1] P. Z. S. 1869, pp. 10 and 33, and fig. 3 A.

indeed it is relatively broader than in any Arctoid yet here noticed. It has two external cusps and one internal cusp, and also an external and an internal cingulum, a small extra cusp being developed upon the latter. The second true molar is tricuspid, and also has its transverse diameter in excess. The lower teeth are like those of *Procyon*, only the first inferior molar has its middle external cusp more predominant in height, so giving that tooth a sectorial character.

There is no cæcum, and there is an *os penis* of considerable size.

Bassaricyon[1].—This genus is only known by a skull collected by Prof. Gabb at Costa Rica, described and figured by Mr. J. L. Allen in the Proc. Acad. Phil. as *B. gabbi*, and by a skin and skull of a second species from Ecuador, described and figured by Mr. Oldfield Thomas under the name of *B. alleni*. The external appearance of the first species is quite unknown. That of the second species is, as Mr. Thomas has pointed out, extraordinarily like that of the Kinkajou[2], so that, but for the skull, "no one could have believed that it was anything but a rather small specimen of that animal." The tail, however, does not seem to be prehensile. There are two mammæ placed far back in the abdomen.

The skull is more like that of *Procyon* and *Nasua* than of *Bassaris*. Its general profile is much like that of *Procyon*; but the orbits are very large, and the postorbital processes of the frontal more developed. There are none from the malar. The temporal ridges are widely separated. The palate is flat, extending much behind the last molars, where it is much narrowed; and the bony floor to the orbit (formed by the malar and maxilla) is very large, and the postorbital processes of the frontals are as long almost as those of *Bassaris*.

Molar formula $=$ P. $\frac{4}{4}$, M. $\frac{2}{2}$.

The teeth are not sectorial, the molars being shorter and more nearly square than in either *Nasua* or *Procyon*, though in one species the second upper true molar is subtriangular as in *Procyon*.

A cast of the inside of the skull shows that the brain possesses an Ursine lozenge[3].

Meles[4].—It would be superfluous to say anything here respecting

[1] See Biol. Centr. Am. p. 70; also Allen, Proc. Acad. Phil. 1876, p. 21, pl. i.; and Bull. U. S. Geol. Survey, v. p. 169; also Oldfield Thomas, P. Z. S. 1880, p. 397, pl. xxxviii.

[2] Mr. Thomas says:—"The external resemblance of this species to *Cercoleptes* certainly seems to be an instance of mimicry, which, so common amongst insects, is so rare among Mammalia. It is, however, very difficult to understand how being mistaken for *Cercoleptes* could in any way benefit *Bassaricyon*; but when more of the habits are known, we may be able to guess at the true use of the likeness. Unfortunately no special notice was taken of the animal by the collector, Mr. Buckley, "as both he and the Indians thought it to be merely the common Kinkajou."

[3] See the paper before referred to, p. 13.

[4] See Linn. Syst. Nat. xii. p. 70; Schreber, iii. p. 516, pl. 142; Pallas, Zoograph. i. p. 70; Buffon, vii. p. 104, pls. 7–10; F. Cuv. Mamm. ii. 36 livr.; Wagner, Suppl. ii. p. 180; P. Gervais, Mammifères, ii. p. 101; Bell, Brit. Quad. p. 122; De Blainville, Ostéographie, *Subursus*; Chatin, Ann. des Sc. Nat. (5e série) vol. xix. (1874) p. 106, figs. 65, 66, & 67 (anal glands and caudal pouch).

the external characters of this well-known genus[1], comprising its three or four species, all exclusively Palæarctic. As to the skeleton, there are 14 or 15 dorsal, 5 lumbar, 3 sacral, and about 18 caudal vertebræ.

The dorsal region I have found to be longer relatively than that of any other Carnivore, being most nearly approached by that of *Ictonyx* and *Conepatus*.

To the cranial characters already given by Prof. Flower[2], it may be noted, in addition, that the development of the sagittal ridge very much approaches that of *Ailuropus*. The infraorbital foramen is as large as in *Ailurus*. The postorbital processes are small as always hitherto, except in *Bassaris* and *Bassaricyon*. The palate extends as much behind the molars as in *Procyon*, but is narrower there than in *Nasua*. The pre- and postglenoid processes are so developed as to hold the mandible in their grasp. The frontal sinuses produce a prominence on the cranium; and the ethmoid is much more voluminous than in the previously noted form, and is even more voluminous than in *Canis*, though not so prolonged. The premaxilla does not attain the frontal.

The transverse processes of the lumbar vertebræ are little developed, much as in *Ailurus*; but there are very large hyperapophyses on the laminæ of the cervical vertebræ. The scapula is very nearly a right-angled parallelogram approaching a square. The ridges and condyles of the humerus are much produced, more so than in *Nasua*; and the metacarpals are stouter than in any form yet noticed.

Molar formula = P. $\frac{4}{4}$, M. $\frac{1}{2}$.

The first upper and lower premolar, however, are quite minute and often fall away. The molars differ from those of any Æluroid, Cynoid, or Arctoid yet described in the great preponderance in size of the first upper molars over the fourth premolars, both above and below.

The first two upper premolars are much like the same teeth in *Procyon* and *Nasua*. The fourth is rather more sectorial than in those two genera, because there is only one internal prominence made of two very small internal cusps, with one developed from the internal cingulum as in the third upper premolar of *Ailurus*, only much less developed and distinct, so that they soon wear down into what is apparently the one prominence just spoken of. Of the three external cusps, the middle one greatly preponderates. This tooth has a superficial resemblance to the same tooth in *Paradoxurus*, *Herpestes*, and especially *Bassaris*.

The first upper molar is different from any tooth of any other Carnivore, but most resembles the same tooth of *Ailuropus*. It has two equal-sized external cusps in front, with two small external cusps behind. One large (especially long) internal cusp, obscurely

[1] I may be permitted to mention that I found the palmar surface naked; but the back of the tarsus was hairy, and naked surface narrow backwards to an acute termination.

[2] P. Z. S. 1869, p. 11.

subdivided, with a very large and very distinct internal cingulum, which rises into an obscure cusp at its postero-internal angle.

The second and third inferior premolars are like those of *Procyon* and *Nasua*. The fourth inferior premolar is a more simple tooth, not only than in any Arctoid yet noticed, but than in any Æluroid and Cynoid, except it be a form in which that tooth is merely rudimentary, as *Proteles*. The crown consists of a single cusp, with the most minute indications of rudimentary ones in front and behind, more so behind. The first lower true molar is like the same tooth of *Procyon*, with a semicircular addition to the talon, bearing three tubercles. It is larger relatively than even the corresponding tooth of *Ailuropus*. The second inferior molar, on the other hand, is a small rounded tooth with a rather large external and rather small internal cusp, with a talon which predominates externally, so as to form a sort of second external cusp.

The tongue is rather long and narrow. There are four circumvallate papillæ on either side diverging from a single, more posterior one.

I could find no trace whatever of a lytta.

The anal glands are normal, but, in addition, there is a very noteworthy bilobed gland, which discharges its secretion into a median pouch or sack, situated beneath the root of the tail, and lined with stiff hairs. This subcaudal pouch is no homologue, though it may be an analogue, of the perineal glands so often found in the *Viverridæ*.

The external ear is short and rounded and inconspicuous.

The brain has the anterior limb of the Sylvian gyrus the narrower. The sagittal gyrus, on the contrary, expands very much forwards and is very contorted, and has certain superficial linear depressions on its more posterior part. The anterior part of the cerebrum is very largely developed, the crucial sulcus being placed very far back. There is a very small but very definite Ursine lozenge[1].

Arctonyx[2].—This pig-like Badger genus comprises only one certainly distinct species, which ranges from the north end of Hindostan and Assam and Northern China. It is remarkable for its long snout with a naked mobile termination, which is truncated and perforated by two large terminal nostrils. It is also noteworthy for the combination of a soft under fur, with long bristly hairs interspersed amongst it. The ears are very short and round and flat. The eyes are small. It is carnivorous and nocturnal.

There are 16 dorsal, 4 lumbar, 4 sacral, and 20 caudal vertebræ. It has almost the relatively shortest lumbar region of any Carnivore, the only shorter being those of *Mellivora* and *Crocuta*. It has the relatively shortest metatarsus of any Carnivore, and the longest palate, compared with the length of the cranium, of any Carnivore, except *Procyon*. It has the narrowest brain-case, relatively, of any Arctoid.

[1] P. Z. S. 1869, p. 14.

[2] See F. Cuvier, Mamm. iii. p. 51; P. Z. S. 1865, p. 137; P. Z. S. 1869, p. 12; Wagner's Suppl. ii. p. 186; Gervais, Mamm. ii. p. 104.

The lumbar vertebræ are found much as in *Meles*. The spinous process of the 13th dorsal vertebra is vertical [1]. The scapula is less quadrate than in *Meles* and more like that of *Procyon*. The fibula is strongly divaricated from the tibia. The proportional length of the ultimate phalanges is nearly the same as in *Meles*.

The skull has the outline of the muzzle, when seen in profile, very like that of *Nasua*, and the lateral posterior portion of the palate shows a trace of the swelling present in the last-named genus. The bony palate is also very prolonged, extending back behind the molars to a line joining the two glenoid surfaces, as it does also in *Procyon* and *Nasua*. In addition to the various cranial characters given by Prof. Flower [2], it may be noted that the sagittal ridge is large, the postorbital processes of the frontal very obscure, and those of the malar wanting. The infraorbital foramen is very large [3] indeed. The pre- and postglenoid processes are smaller and shorter than in *Meles*. The pterygoids descend much as they proceed backwards, are twisted, everted, and somewhat bullate.

The *basis cranii* is more flattened than in any form yet here noted. The mastoid and paroccipital processes form together a continuous ridge on each side of the skull round the region of the bulla, from which the principal process is rather remote. The glenoid foramen is singularly posterior in position with respect to the glenoid surface. The zygomata do not arch much outwards. The angle of the mandible is, as it were, more pushed up close to the condyle than in any form yet noticed, and projects so little as to be almost obsolete. There is no distinct subangular process, but only a roughened tract in the place of it.

Molar formula=P. $\frac{4}{4}$, M. $\frac{1}{2}$.

The first premolar above and below is often rudimentary or absent. The form of the molars is much like that in *Meles*; but the preponderance of the first upper molar over the sectorial is slightly less. The fourth upper premolar is very like that of *Meles*; but it has but a single inner tubercle, and this is smaller than the corresponding part in the tooth of *Meles*. The first upper true molar is quite like what that of *Meles* would be if its anterior internal angle were obliquely cut off. The lower premolars and molars are like those of *Meles*, except that the second true molar is longer in proportion to its breadth.

The canines are more trihedral than hitherto, and the upper incisors are arranged in a more prolonged curve, and the lower ones are more proclivous.

The tongue has two or three circumvallate papillæ on each side of the median line, and narrow as usual. Small papillæ are scattered everywhere, and coat the tongue, which offers no conspicuous character.

The anal glands are normal.

[1] As also in *Meles*. It is the 12th which is vertebral in *Procyon* and *Cercoleptes*, and the 11th in *Ailurus* and *Bassaris*.

[2] P. Z. S. 1869, p. 12.

[3] It is at its maximum, amongst Carnivores, in this genus and *Lutra*.

Taxidea[1].—The American Badger, or Carcajou, is an indefatigable burrower. It eats Spermophiles, Arvicolas, birds' eggs, and snails, also honeycomb, wax, and bees. The bones and wool of lambs have been found in its burrow. In the north it hibernates from November to April, but does not lose much flesh. It has three or four young at a birth. It is so strong an animal that two men have been unable to pull it out of its burrow by its hind legs. For further details as to its habits, see Coues, 'Fur-bearing Mammals,' p. 285, and also Audubon and Bachman, vol. i. p. 363.

It is remarkable for the enormous claws of its fore paws. The muzzle is furry except at its extremity, which is naked, inclined downwards and backwards, with a median, vertical groove. The nostrils are not visible laterally. The eye is small and high up. The ears are low, rounded, and very broad, with an exceptionally large external aperture protected by long hairs. The palmar and plantar surfaces bear naked pads. It varies much in colour. The short tail has beneath it a subcaudal pouch (as in *Meles*), with a bilobed prominence in front of it. A good account of the habits of the animal will be found in Coues's 'Fur-bearing Mammals,' p. 280. It ranges through western and central North America from N. lat. 58° into Mexico.

There are 15 dorsal, 5 lumbar, 3 sacral, and 14 or more caudal vertebræ. The ultimate phalanges of the digits of the manus are very much longer relatively than those of any other Carnivore, those even of *Suricata* being but little more than half the relative length of those of *Taxidea*. The pelvic limb is but of the same length as the pectoral limb, a condition which only obtains besides in *Mydaus* amongst Carnivores. Only in *Crocuta* is the pectoral limb the longer.

Hence, for the first time in our examination of Arctoids, we find the scapula with the postero-superior angle sharply produced. The metacarpals are still shorter relatively than in *Meles*. There are very large hyperapophyses on the laminæ of the cervical vertebræ.

In addition to the cranial characters described by Prof. Flower[2], we may note that the mastoid and paroccipital processes are much less prominent than in the form last described, the mastoid not descending below the inferior margin of the meatus auditorius externus[3]. The palate is a little less prolonged behind the last molars than in *Meles*, and much less so than in *Arctonyx*. The postglenoid

[1] See Baird, Mam. of N. A. 1857, pp. 202, 745, pl. 39. fig. 2; Gray, P. Z. S. 1865, p. 141; Stev. U. S. Geol. Survey Terr. 1870, 1871, p. 461; Allen, Pr. Boston S. Nat. H. xiii. 1870, p. 183, and Bull. U. S. Geol. and Geogr. Surv. Terr. vol. ii. no. 4, 1875, p. 330; Waterhouse, P. Z. S. 1838, p. 154, and Trans. Z. S. 1841, p. 343, pl. lix.; Buffon, Hist. Nat. Suppl. iii. p. 242, pl. 49; Coues, Fur-bearing Mammals, 1877, p. 261; Wagner's Supp. ii. p. 182; F. Cuv. Mamm. iii. p. 45; Gervais, Mamm. ii. p. 103; Gmelin, Syst. Nat. i. (1788) p. 102. n. 7; Shaw, Gen. Zool. i. 1800; Fischer, Syn. 1829, p. 151; Lesson, Mam. 1827, p. 141. no. 372; Richardson, F. B. A. i. p. 37. no. 12, pl. ii.; Audubon and Bachman, Q. N. A. i. p. 360, pl. 47.

[2] P. Z. S. 1869, p. 11.

[3] It does not so descend in *Ailurus* and *Bassaris*.

process is not so long as in *Meles*, and the zygomata are not so arched outwards; the skull has no such produced sagittal ridge, but is more flattened and much more broadened out posteriorly, like that of some aquatic forms. The muzzle is also shorter. The malar develops a distinct postorbital process, and that of the frontal is at least as marked. The infraorbital process is still very large. There is no subangular process.

Molar formula, P. $\frac{3}{3}$, M. $\frac{1}{2}$.

The upper incisors stand almost on a straight line, so slight is the curvature of their range. The first upper premolar seems to be always absent very early, and the first lower are generally so. The first upper molar, instead of greatly preponderating over the fourth upper premolar, is of about the same size. Compared with the teeth of *Meles*, the third upper premolar is larger, and the first molar smaller. The fourth upper premolar is, like that of *Meles*, more quadrate and developed, with the anterior and posterior external cusps larger, the antero-internal cusp much more developed, but no internal cingulum. The first true molar has its postero-external angle atrophied (compared with that of *Meles*), while it develops inwards somewhat posteriorly. It has the same essential pattern on its grinding surface, but the cusps are reduced so as to form as it were only a crumpled superficial irregularity, something like that of the third upper true molar of *Ailuropus*, with its postero-external angle obliquely cut away. There is really both a small external and a large internal cingulum, and also two minute external cusps (within the external cingulum), an internal cusp (enclosed by the internal cingulum), and the median prominence of *Meles*, here subdivided into two prominences, one in front of the other.

In the lower jaw, the second and third premolars are as in *Meles*. The fourth is peculiar, and consists of three cusps, whereof the first and second are very light, and form a sectorial blade to fit against the front part of the fourth upper premolar. Behind these is a small, low cusp. The first molar is very like the corresponding tooth of the Civet, but the antero-external cusp is higher, and the talon larger, supporting five minute tubercles. The anterior sectorial part bites against the hinder part of the fourth upper premolar. The second molar is small, rounded, and quadricuspidate.

The bone of the penis is four inches long; one end of it has the form of a club, the other is bent at right angles to the shaft of the bone, and is flattened and grooved.

Mydaus[1].—The Teledu, a small burrowing Badger, of Java and Sumatra, is found at an elevation of 7000 feet or more, and is but about one third of the size of the Common Badger. There is but one true species of the genus. It has an elongated movable snout,

[1] See Horsfield, Zool. Research. n. 2; F. Cuvier, Mamm. ii. p. 27, and iii. p. 51; Desmarest, Mamm. p. 187; Raffles, Linn. Trans. xiii. p. 251; Gray, M. Zool. i. tab. 6 & 7; Wagner's Supp. ii. p. 184; Gervais, Mammifères, ii. p. 105.

obliquely truncated terminally, with inferior nostrils. There is not only a median nasal groove, but there is also a vertical groove on either side of it. Tail very short, but clothed with long hairs. Ears with quite a rudimentary pinna; a small vertical fold behind the meatus.

The palms and soles are naked. The claws are much longer on the manus than on the pes; the former are very long, but not quite so long relatively as in *Taxidea.*

There are 14 or 15 dorsal, 6 or 5 lumbar, 3 sacral, and 12 caudal vertebræ. As to the relative proportion of parts with body, the humerus is larger than in any other Carnivore, the next longest being that of *Ailurus.* The tail is shorter than that of *Arctonyx.* The skull is nearly relatively as long as that of *Nasua.* As in *Taxidea,* the pectoral and pelvic limbs are of equal length. The transverse processes of the lumbar vertebræ are very short. The 12th dorsal vertebra has its spine vertical. The scapula has its postero-superior angle somewhat pronounced. The metacromion is very small, but a similarly directed process extends backwards from higher up the spine to the scapula, as if the metacromion process had slipped up. The humerus, however, has an olecranal as well as a condyloid perforation. Both the pollux and hallux are very well developed.

In addition to the cranial characters already described by Prof. Flower[1], it may be noted that the palate has laterally a certain swollen appearance, reminding us of *Nasua.* The mastoid is much swollen, but does not depend below the meatus auditorius externus. As in *Arctonyx* so here, the paroccipital process is remote from the bulla. As in *Arctonyx,* again, the muzzle has a *Nasua*-like aspect when seen in profile. The supraorbital is relatively, as well as absolutely, smaller. Altogether the skull is *Arctonyx*-like, because, though the bullæ are more bullate, yet they are but slightly bullate considering the small size of the animal. The zygomata are weaker relatively than in *Arctonyx.* The meatus auditorius externus is very large relatively. As in *Arctonyx,* there is no malar postorbital process; and the postorbital process from the frontal is still more blunt than it is in that genus. As in *Arctonyx,* the glenoid foramen is much posterior to the glenoid surface.

The mandible has a larger and more oblique symphysis than in any form yet described. It is larger even than in *Eupleres,* and the two rami have anchylosed together. Moreover the symphysis is not only long, but also broad and conspicuous. The angle is pushed up, as in *Arctonyx,* with a strongly everted margin running down from it to the place of the subangular process, and seeming to represent a toughened tract which exists in *Arctonyx.*

Molar formula$=$P. $\frac{4}{4}$, M. $\frac{1}{2}$.

The incisors are exceptionally broad relatively. The grinders are formed quite on the *Arctonyx* type, though their cusps are generally more acute, and the first upper true molar is relatively smaller and

[1] P. Z. S. 1869, p. 12.

less complex in that it has the internal cingulum reduced. The lower grinders are like those of *Arctonyx*.

The anal glands are large and their secretion approximates in offensiveness to that of the Skunks.

Mephitis[1].—In this genus the muzzle is pointed, the nostrils lateral, the feet narrow, with the palmar surfaces naked, the plantar surfaces partially hairy, and a long and bushy tail. There are several, probably three, species, all either North or Central American (ranging from Hudson's Bay and the Great Bear Lake to Guatemala) and extraordinarily variable not only in the markings of the long loose fur and in the degree of hairiness of the soles, but in the form of the cranium also. Yet the coloration is very consistent; black and white, the normal arrangement of which is—general colour black with white markings and for the most part more or less longitudinally disposed. The Skunks are terrestrial and more or less fossorial, with strong claws to the fore paws; progression is semiplantigrade, and slow, and the general form of the body stout and rather low. There is no subcaudal pouch, but the anal glands are extraordinarily developed, invested by a muscular tunic, and their contents can be ejected a distance of fourteen feet, the tail being held erect and the anus everted. It does not ordinarily smell and may be eaten. The Skunk is more or less thoroughly nocturnal and is easily trapped. Its fur goes by the name of "Alaska sable." It does not become rare in settled districts[2], and is very prolific, bringing forth 8 or 10 young. It is more gregarious than most creatures of the weasel kind (*Mustelidæ*), more than one family congregating in one burrow. It eats worms, insects, birds' eggs, frogs, and mice, and sometimes rabbits, as also roots and berries; it occasionally robs the poultry-yard, and is said to be fond of milk. It falls a prey to dogs and the Great Horned Owl. Its bite sometimes produces hydrophobia; it can be readily semidomesticated like a ferret, and it is said sometimes to have had its anal glands successfully removed.

The eye is small, nearer to the nose than to the ear; ears short and rounded.

It has 16 dorsal, 6 lumbar, 2 sacral, and 21 caudal vertebræ. The third phalanx of the third digit of the manus is relatively longer than in any other Carnivore except *Taxidea*. The length of the palate compared with that of the skull is less than that of any other Arctoid except *Putorius*.

[1] Shaw, G. Zool. i. (1800) p. 390, pl. 94; Gmelin, Linn. xiii. 1, p. 88; Humboldt, Obs. de Zool. p. 350; Buffon, xiii. p. 287, pl. 39; and Suppl. vii. p. 233, pl. 57; F. Cuv. Mamm.; Stev. U. S. Geol. Surv. for 1870, 1871, p. 461; Parker, Am. Nat. v. 1871, p. 246; Coues, Bull. U. S. Geol. & Geogr. Surv. Terr. 2nd series, no. 1 (1875), and Fur-bearing Animals, p. 187; Allen, Bull. U. S. Geol. Survey, vol. ii. no. 4. 1876, p. 332; Licht. Darstell. Säug. 1827–34, pl. 45, and Abh. Akad. Wiss. Berl. 1836–38, p. 280; Maximilian, Reise N. A. i. 1839, p. 250; Arch. f. Naturg. 1861; Wagner, Supp. ii. p. 198; Aud. & Bach. Q. N. A. i. 1849, pl. 42; Richardson, Zool. Beechey's Voy. 1839, p. 4; Wyman, Pr. Boston Soc. 1844, p. 110; Warren, Pr. Boston Soc. 1849, p. 175; Baird, N. Am. Mamm. p. 193; P. Gervais, Mamm. ii. p. 106; Biologia, p. 80.

[2] Being so much protected by its secretion, which enables it to live without being able to run fast, climb trees, swim, or even burrow with great rapidity.

The lumbar transverse processes are very small indeed, and the humerus has no intercondyloid canal.

The more important cranial characters have been described by Prof. Flower[1]. It may here be noted in addition that the mastoid process does not descend below the meatus auditorius externus, but a ridge continues on from it to the paroccipital process and tends to form a wall around a depressed surface as in *Arctonyx*. There is a peculiar and marked bony canal which is posterior and internal to the conspicuous carotid foramen extending from within the latter backwards towards the foramen lacerum posterius. The palate does not extend back beyond, or hardly beyond, the last molars. The bulla develops an anteriorly extending pointed process, which approximates to, but does not join, the pterygoid. The zygomata arch rather strongly outwards, but do not develop a postorbital process, and there is hardly any such process from the frontal. The muzzle is short and there is a sagittal ridge. The infraorbital foramen is rather or very small and may be double or triple; the palate hardly extends back beyond the last molars. The angle of the mandible is rather marked and is not pressed towards the condyle.

Molar formula = P. $\frac{3}{3}$, M. $\frac{1}{2}$.

The fourth upper premolar is rather sectorial and much like that of the Civet and of *Grisonia*, but the internal and postero-external cusps are rather smaller than in the latter. The first true molar is large and nearly square, a little broader than long, on the type of that of *Meles*. The two cusps of the external cingulum blend with the two principal external cusps, and there are two internal cusps and an internal cingulum. The first inferior true molar has one anterior cusp, behind which are two cusps, one external, the other internal, of about equal size, followed by a talon with two or three cusps, but which does not form half of the tooth. The second inferior true molar has a rather triangular grinding surface, with three tubercles developed as it were on a ridge surrounding a central depression.

Conepatus[2].—This more southern form extends from the south-western United States and Texas through all Central and South America. It has no median groove on nose or upper lip. The

[1] P. Z. S. 1869, p. 11.

[2] See Gmelin, Syst. Nat. i. (1788) p. 88. no. 15; Shaw, Gen. Zool. (1800) p. 392; Humboldt, Rec. Obs. Zool. i. p. 350; Lesson, Mam. (1827) p. 151, n. 407; Fischer, Syn. (1829) p. 161; Licht. Abh. Ak. W. Berlin (1837), p. 270; Tschudi, F. Peruana (1844–6), p. 113; Baird, N. A. Mam. p. 192, and Report U. S. B. S. ii. Mam. p. 19; Tomes, P. Z. S. 1861, p. 280; Audubon and Bachman, Q. N. A. ii. (1851) p. 18, pl. 53; Bennett, P. Z. S. 1833, p. 39; Gray, Cat. Carn. Brit. Mus. p. 134; Coues, Fur-bearing An. p. 249; Biologia, p. 84; De Saussure, Rev. et Mag. de Zool. 1860, xii. p. 6; Frantzius, Arch. f. Natur. xxxv. 1, p. 289; Chatin, Ann. Sc. Nat. 5e série, xix. (1874) p. 100, pl. 6. figs. 59–63, showing aspect of anus and extraordinarily large anal glands. Audubon remarks that this animal "is found in the brown, broomy, sedgy plains, as well as in the woods and cultivated districts of Texas and Mexico," and that it "eats grubs and insects, small beasts and birds' eggs, and all it can." It "dwells in burrows and the roots of trees, or in fallen trunks, or in cavities under rocks. It is easily caught going to its burrow and there remaining till worried out. It is nocturnal and a destroyer of poultry."

external ears are very little developed. The snout is truncated, the nostrils opening forwards, not downwards. The feet are broad, with wholly naked soles. The tail is shorter and more closely haired than in *Mephitis*. It is very variable in colour.

There are 16 dorsal, 4 lumbar, 3 sacral, and 18 caudal vertebræ. The pelvic limb is longer compared with the spine than in any other Arctoid except *Procyon* and some Bears. The first lower true molar is longer compared with the length of the skull than in any other Arctoid.

In the form of the skull and teeth *Conepatus* closely resembles *Mephitis*. The auditory bulla is rounded, apparently undivided internally, and most prominent towards the centre of the basis cranii. The foramen condyloideum is conspicuous, but is placed far forwards and close to the large foramen lacerum posterius. There is a conspicuous carotid foramen, just behind the middle of the inner margin of the bulla. The glenoid foramen is just above the auditory meatus, which inclines forwards. There is a rather marked paroccipital process, which is quite away from the bulla and prominent mastoid process, the latter depending quite to the level of the floor of the meatus, if not below it. No ridge quite connects the paroccipital and mastoid processes. The zygoma is delicate and weak, and bears no postorbital process, while that of the frontal is only a slight rounded prominence. The cranium is long and the muzzle short. Sagittal ridge present or absent. There is a moderate single or supraorbital foramen or two small foramina. The posterior palatine foramina are placed in the front half of the palate. The palate is broad and flat, and extends decidedly, though not much, backwards behind the hinder molars. The angle of the mandible is marked and is not pressed upwards. The canines are very small.

Molar formula$=$P. $\frac{2}{3}$, M. $\frac{1}{2}$.

The third upper premolar is small and triangular. The fourth has a large middle and posterior outer cusp, and a very small anterior outer cusp and a large internal cusp. The functional surface of the tooth is triangular, broader behind than in front. The first upper molar is large and quadrate, with a surface formed on the type of that of the Badger. There appear to be four principal cusps, whereof the two posterior are the smaller. There are also one or two small cusps on the external cingulum, and there is a well-developed ridge-like internal cingulum. It is larger compared with the fourth premolar than in *Mephitis*. The second inferior premolar is very small. The third and fourth have each one considerable median cusp with a small cusp on either side of it. The first inferior molar has a single front cusp, followed by two, one internal and one external. Behind them is a talon, which constitutes half the tooth or even more. The second inferior true molar is small and rounded.

Mellivora[1].—The genus *Mellivora* is the first genus of Arctoids

[1] See Shaw Zool. i. p. 470 (1800); Fischer, Syn. Mam. p. 151; Hardwick, Linn. Trans. ix. p. 115, pl. 9; Bennett, Zool. Gard. p. 13; De Blainville, Ostéologie, *Mustela*; Desm. Mam. p. 176; Schreber. Säug. p. 450, pl. 135; Sunde-

which is common to Asia and Africa, one species being found in Western and Southern Africa and another in India. Badger-like in figure, with stout body, short limbs, and plantigrade extremities, they have also a short tail, and external ears so small as to be rudimentary. The pinna has indeed no free edge, but an obtuse thick hinder margin, whence the transverse ridges proceed inwards. There is no distinct tragus or antitragus. There is a rather pointed muzzle.

The palmar and plantar surfaces are naked. In their peculiar coloration (grey above, black below) they afford an instance of that tendency to longitudinal markings which appears again and again in Arctoid genera.

There are 14 dorsal, 4 or 5 lumbar, 4 or 3 sacral, and 15 or 16 caudal vertebræ. Here the cervical region attains its greatest relative length in any Arctoid, while the lumbar region is shorter than in any except *Melursus*; and the fore and hind limbs are more equal in length than in any others except *Taxidea* and *Mydaus*.

All the neural spines of the vertebræ, from the 15th to the 4th sacral inclusive, are vertical. The lumbar transverse processes are very small. The humerus has a large olecranal perforation, but sometimes the internal condyloid canal is absent. Sir Richard Owen says that there is no medullary cavity in the tibia [1].

The cranial characters have been described by Professor Flower [2]; but it may be further noted that the paroccipital and mastoid processes do not make a continuous ridge or wall. The latter process hardly depends below the external meatus. The aspect of the skull is very like that of *Meles*, but the forehead is more rounded transversely, and the sagittal ridge is much smaller, though the zygomata are not so strongly arched and the infraorbital foramen is much smaller.

The angle of the mandible is less conspicuous than in *Meles*, hardly more so than in *Arctonyx*. The margin of the mandible below it is roughened and somewhat everted, so as to form a sort of slightly defined subangular process. The palate is less prolonged and its hinder part is bounded laterally by a very strong plate-like ridge, which continues on to the hamular processes of the pterygoids, which descend below the level of the palate in a very exceptional manner. There is no malar postorbital process, and that of the frontal is very blunt.

Molar formula = P. $\frac{3}{3}$, M. $\frac{1}{1}$.

The third upper premolar is like that of the Civet, except that the posterior cusp is more developed. The fourth premolar has the external cusps (whereof the anterior is the larger) and a large internal cusp, as in the Civet, opposite the principal external one. The first upper molar is a short but wide tooth, considerably wider

vall, Kong. Vet. Akad. Handl. 1841, p. 211; Sclater, P. Z. S. 1867, p. 98, pl. 8; Wagner, Supp. ii. p. 207; Sparrmann in K. Vetensk. Acad. Handl. (1777) p. 49, pl. 4; P. Gervais, Mamm. ii. p. 109.

[1] P. Z. S. 1869, p. 12.

[2] Anat. of Vertebrates, vol. ii. p. 509.

within than without. There are two minute external cusps, a considerably larger internal cusp, and an internal cingulum.

The fourth inferior premolar is much like that of *Hyæna*, but with two minute cusps in front of and two behind the large single median cusp. The first lower true molar is sectorial, a good deal like that of the Civets, but with no internal cusp and but a very small talon.

The brain [1] presents a long oblique Sylvian fissure and a Sylvian gyrus, the anterior limb of which is exceedingly narrow. The sagittal gyrus expands very much anteriorly. There is an Ursine lozenge of a rather elongated shape.

Helictis [2].—This genus contains four species of small more or less arboreal Arctoids from Eastern Asia. The body is elongated and the limbs short, the tail being either short or of moderate length and bushy. The ears are small. The snout is elongated, obliquely truncated, and naked at the tip, which bears a distinct nasal groove, which extends down the upper lip. The palmar surfaces are naked, but the plantar surfaces are clothed with hair on the hinder half; yet the habit is said to be plantigrade.

There are 14 dorsal, 6 lumbar, 3 sacral, and 18 caudal vertebræ.

The cranial characters other than those given by Professor Flower [3] are that the skull has a rather long muzzle, somewhat like that of *Nasua*. The occiput shows a marked cerebellar prominence. There are marked postorbital processes from the frontals, but hardly any from the malar bones. The zygomata do not arch strongly outwards. The mastoid process does not descend quite to the level of the floor of the meatus auditorius externus. The palate extends back but little behind the last molars. There is a large infraorbital foramen. The angle of the mandible is formed as in *Meles*.

Molar formula $=$ P. $\frac{4}{4}$, M. $\frac{1}{2}$.

The fourth upper premolar is quite like that of *Taxidea* [4]. The first upper true molar diverges from the form met with in the Badger group (i. e. *Meles, Taxidea, Arctonyx*, and *Mydaus*), and approaches that found in *Procyon*. It is like the first upper true molar of *Procyon*, with the postero-external and postero-internal cusps (especially the latter) reduced in size and with an enlarged internal cingulum. There is also a distinct external cingulum, which tends to develop two small cusps just outside the two external principal cusps. The fourth lower premolar has one principal cusp with a minute accessory cusp in front of it and two larger ones behind it. The first lower true molar has two external cusps, the hinder one of which slightly predominates. There is also a large internal cusp as

[1] See *l. c.* p. 14, figs. 2 and 3.

[2] See Is. Geoff. Voy. de Bélang. Zool. p. 129, pl. 5; Guérin, Mag. Zool. 1835, vol. i. pl. 14; Horsfield, Zool. Research.; Desm. Mamm. p. 537; Cuv. Rech. iv. p. 474; Temminck's Monograph, i. p. xx; Hodgson, Journ. Asiatic Soc. of Bengal, v. p. 237, vi. 2, p. 560; Wagner, Supp. ii. p. 201; P. Gervais, Mamm. ii. p. 105; Gray, Pr. Zool. Soc. 1833, p. 94, 1853, p. 191, 1865, p. 152; Cat. Carnivora Brit. Mus. p. 141; De Blainville, Ostéographie, *Mustela*.

[3] P. Z. S. 1869, p. 12.

[4] See above, p. 278.

well as also a well-developed talon, which may be minutely tricuspid. The second lower true molar is a small rounded tooth, the grinding surface of which presents a median depression surrounded by a low wall.

The brain[1] (which has been described and figured by the late Professor Garrod) presents the peculiarity of the hippocampal gyrus rising to the surface on either side of the great longitudinal fissure, and so making its very distinct Ursine lozenge incomplete behind. The callous marginal and crucial sulci unite, as also do the parietal and sagittal gyri at the posterior upper angle of the cerebrum.

Ictonyx[2].—In colour and markings, as well as in the odour of the secretion of its anal glands, the one or two species which form this genus resemble the Skunks; so much so, that did they inhabit the same region, and were they devoid of an offensive secretion, they would certainly be said to mimic the Skunks. They differ greatly from the Skunks, however, in the form of the teeth, in which they approximate to the Weasels.

The head is conical, with a pointed nose, marked at the tip with a median groove. The ears are rounded and hairy. The claws are long and pointed and not retractile. The hind foot is digitigrade, with the hinder part of the sole hairy. The tail is long and covered with long hair. The body is elongated, the lines short.

There are 15 dorsal, 5 lumbar, 2 sacral, and 23 caudal vertebræ. The dorsal region is almost the longest relatively, and the sacral region is the shortest of any Arctoid. The third phalanx of the third digit of the pes is also at its maximum of relative length, as is the breadth of the brain-case, the length of the lower molar series, and the length of the fourth upper premolar, the length of the spine being the standard of comparison.

The cranium has the characters mentioned by Prof. Flower[3], as also the following ones. The frontal postorbital processes are marked, but there are none from the malars. The zygomata do not arch strongly outwards. The size of the infraorbital foramen is moderate. The palate extends back but little behind the last molars. The mastoid processes are rather prominent, but do not descend to the level of the floor of the meatus auditorius externus. The stylo-mastoid foramina are very conspicuous, and the opening of the external auditory meatus is very large. The angle of the mandible resembles in form that of *Meles*.

Molar formula = P. $\frac{3}{3}$, M. $\frac{1}{2}$.

The general form of the teeth is that which exists in *Mustela*[4], but the first upper true molar is larger, and it is much wider than long and has five cusps. Two of these are the two external principal cusps, outside which is a single cusp developed from the

[1] See *l. c.* p. 18 and P. Z. S. 1879, p. 307, figs. 1 and 2.

[2] Or *Zorilla*. See Schreber, iii. p. 445, pl. 123; Buffon, xiii. p. 289, pl. 41; Lichtenst. Berlin Abh. 1838, p. 281, pl. 2; Gray, Lond. Mag. i. p. 581; P. Z. S. 1865, p. 151, Cat. of Carniv. Brit. Mus. p. 139; De Blainville, Ostéogr. *Mustela*; Wagner, Suppl. ii. pp. 199 and (*Rhabdogale*) 219; P. Gervais, Mamm. ii. p. 115.

[3] P. Z. S. 1869, p. 13, *Rhabdogale*.

[4] See below, p. 378.

external cingulum. Two other cusps are developed from the internal cingulum. The fourth lower premolar has one principal cusp, with a very small one in front of it and two large ones behind it. The first lower true molar has two external cusps in front; the hinder one predominates greatly. There is also an internal cusp (less developed than in *Helictis*), and a distinct talon with three small cusps. The second lower true molar has three small external cusps and one large internal cusp.

The brain[1] has a long, oblique, Sylvian fissure; the Sylvian gyrus is much narrower in front than behind. The parietal gyrus is simple. The sagittal gyrus is wide, especially towards its anterior end. There is a distinct but small Ursine lozenge and calloso-marginal and crucial sulci join. The parietal and sagittal gyri unite posteriorly, as they do in *Helictis*.

Galictis[2].—The Tayra has the digits closely connected, the soles naked, and the gait almost plantigrade. The nose has a median groove. The ears are short and rounded. The pupils are round. The concha is small and flat, with a very shallow pouch, and then superimposed transverse ridges. The Tayra ranges from the Rio de la Plata northwards to Mexico. It is more or less gregarious, that is to say it has been observed in troops of from 15 to 20 individuals sometimes, at least in British Honduras.

There are 14 dorsal, 6 lumbar, 3 sacral, and 23 caudal vertebræ. The neck is relatively long, longer than in almost all other Arctoids. The first and second lower true molars are at almost their minimum length amongst Arctoids, compared with the length of the skull.

The scapula has a very distinct and well-developed metacromion. Both hallux and pollex are fairly developed.

The skull has a sagittal ridge and its zygomata are rather strongly arched outwards. The bulla is like that of *Meles*, with its ridge more rounded. The glenoid foramen is large and opposite the middle of the postglenoid process. The paroccipital process is but little prominent and is applied to the back of the bulla. The mastoid process is rounded, so as to be little conspicuous. It does not depend below the meatus. The muzzle is short. There are frontal sinuses. The palate is wide and extends backwards beyond the last molars much as it does in *Meles*. There is a small postorbital process developed from the malar and a pretty good one from the frontal. The infraorbital foramen is moderate. The meatus auditorius externus is short and of moderate capacity. The angle of the mandible is pressed up very near to the condyle, and the margin

[1] *L. c.* p. 18.

[2] See Linn. Syst. Nat. (1766) i. p. 67; Schreb. iii. p. 493; Desm. Mamm. p. 175*; Rengger's Paraguay, p. 119; Traill, Mem. of the Werner. Soc. iii. p. 440, pl. 23. Tayra, Buffon, Suppl. vii. p. 250, pl. 60; Azar. Ess. i. p. 197; Fr. Cuv. Mamm. iii.; Wagner, Suppl. ii. p. 214; Biologia, p. 79; Bell, Zool. Journ. ii. (1826) p. 552; Frantzius, Arch. f. Naturg. xxxv. 1, p. 287; Moore, P. Z. S. 1859, p. 51; P. Gervais, Mamm. ii. p. 110; Gray, P. Z. S. 1865, p. 121; De Blainville, Ostéog. *Mustela*; Cat. Carnivora Brit. Mus. p. 99; Tschudi, Fauna Peruana & Arch. 1844, p. 248; Hernandez, vol. vii. cap. 21, the Tapeytzcuitli.

below it is much flattened and everted. The angle is, however, more conspicuous than in *Arctonyx* or *Mydaus*.

Molar formula = P. $\frac{3}{3}$, M. $\frac{1}{2}$.

The fourth upper premolar is formed like that of the Civet. The first upper true molar is very short but wide, more like that of *Hyæna* than is the same tooth in any Arctoid yet here noticed. It is, however, relatively wider within than without inwards. There are two minute external tubercles and a yet smaller internal one, within which is a large internal cingulum. The three inferior premolars are much as in *Meles*. The first lower true molar is very sectorial, and not quite like any tooth as yet here described. It is a good deal like that of the Civet, with the talon reduced, or like the front half of the same tooth in *Meles*, with only a very small talon instead of the large one of the Badger. The most anterior cusp is narrower than the one behind it, and their adjacent margins form together an acute angle. The second true lower molar is a small rounded tooth. The liver is very like that of *Nasua*, but the part of the right central lobe which is on the left of the gall-bladder is large.

The brain [1] is very complicated in its dorsal convolutions. The Sylvian fissure is long and oblique and the anterior limb of the Sylvian gyrus is very decidedly the narrower. There is a small Ursine lozenge. The crucial and calloso-marginal sulci do not join, a bridging convolution connecting the hippocampal and sagittal gyri behind the crucial sulcus.

Grisonia [2].—The Grison has a tail about half the length of its slender body. The nose is destitute of any median groove and the muzzle is rather acute. The eyes are short, broad, and rounded; the legs are short. The soles are naked, and locomotion is semiplantigrade.

It inhabits Tropical and South America.

There are 16 dorsal, 5 lumbar, 3 sacral, and 21 cervical vertebræ. It has the relatively shortest Arctoid radius except *Lutra*. Compared with the length of the head it has the broadest palate of any Arctoid.

The only cranial differences from *Galictis* I observed were that the foramen glenoideum is very small, instead of large, and that the meatus auditorius externus is both long and very wide.

The first cusp of the first lower molar is wide, and quite as wide as the second, and their adjacent edges form an obtuse angle.

The liver is like that of *Galictis*, but the left central lobe is smaller, and the right central lobe is uniform in its diaphragmatic aspect.

[1] See *l. c.* pp. 15 & 16, figs. 4 & 5.

[2] See Schreber, Säug. p. 447, pl. 124; Thunberg, Mém. Acad. St. Pétersb. vi. p. 401, pl. 13; Traill, Mem. Wern. Soc. iii. p. 437, pl. 19; Desmarest, Mam. p. 175; Molina, Chile, iv. p. 258; Shaw, Gen. Zool. i. p. 433; Bell, Trans. Zool. Soc. ii. p. 204, pl. 37; Buffon, H. N. Supp. iii. p. 170, pl. 25; Martin, P. Z. S. 1833, p. 140; Gray, P. Z. S. 1865, p. 122, Cat. Carniv. B. Mus. p. 99; De Blainville, Ostéog. *Mustela*; Waterhouse, Zool. of 'Beagle,' i. p. 21; Wagner, Supp. ii. p. 215; P. Gervais, Mamm. ii. p. 110; Azara, Ess. i. p. 190.

The tongue has rather small but very marked pyriform papillæ scattered all over its surface. The flattened papillæ are considerably elongated and rather conspicuous. The circumvallate papillæ form a V with three fine papillæ in either limb and one at the apex.

The brain[1] is very different from that of *Galictis*, in that its hippocampal gyrus is cut off from the sagittal gyrus by the junction of the calloso-marginal and crucial sulci. There is a more or less well-defined Ursine lozenge.

Mustela[2].—The Martens, or Stouter Weasels with normally four premolars on each side, both above and below, present us with the first Arctoid genus, but not species, common to the Old and New Worlds. Of the nine or ten species which appear to compose it, some are common to Europe and Asia, but none to the Palæarctic and Nearctic, or to the Palæarctic and Oriental regions, though the *M. flavigula* extends from Northern Hindostan to Java, Sumatra, and Borneo. No species is Neotropical. The American Pekan[3], *M. pennanti*, is the giant of the genus, which may be 30 inches from snout to tail-root, with the tail 16 inches long.

The body is long, the limbs short and digitigrade, the pectoral limb being about 54, and the pelvic limb 69, to the spine taken at 100.

The ears are low, broad, and hairy on both sides. There is a distinct pouch, a moderate tragus and antitragus, a small helix, a very prominent supratragus overhanging a fossa bounded beneath by a rather marked transverse ridge and surmounted by another fossa, bounded above by a rounded transverse ridge. The nose has a median vertical groove.

The soles and palms are generally hairy. In some forms, as in the Sable, they are extremely furry, but sometimes in southern species the palms and soles are naked[4].

There are 14 dorsal, 6 lumbar, 3 sacral, and from 18–23 caudal vertebræ.

The metatarsals are at their maximum of relative length amongst Arctoids, while the length of the skull may be at its minimum (14·5 to 100) as also the length and breadth of the palate, width of the zygomata, the brain-case, the breadth behind the orbits, the length of the first upper true molar and of the second lower true molar, all compared with the length of the spine from the atlas to the end of the sacrum.

Here the neural spine of the eleventh dorsal vertebra inclines forwards. The scapula has a large metacromion process.

[1] See *l. c.* pp. 16 & 17, figs. 6 & 7.

[2] *Mustela*, Linnæus, Wagner, P. Gervais, and others; *Martes*, Gesner, Ray, Bell, Gray, Fitzinger, &c. For synonymy see Coues, 'Fur-bearing Animals,' pp. 59, 62, 74, 77, 79, 81, 97, &c.

[3] Pekan, Buffon, H. Nat. xiii. p. 304, pl. 42; Audubon & Bachman, Q. N. A. i. 307, pl. 41; the European and American Sables (*M. zibellina* and *M. americana*) belong to this genus; the Weasels, Ermines, Stoats, Ferrets, Polecats, Minks, and Vison, to *Putorius*.

[4] I am indebted to Mr. Oldfield Thomas for calling my attention to this fact.

To the cranial characters mentioned by Prof. Flower[1] may be added the small length of the muzzle compared with the great length of the cranium proper. The infraorbital foramen is rather large, the zygomata delicate but well arched outwards, and the palate is prolonged backwards behind the last molars.

The angle of the mandible, though much pressed upwards, is still distinctly distinguishable.

Molar formula = P. $\frac{4}{4}$, M. $\frac{1}{2}$.

The dentition is more sectorial than heretofore. The second upper and lower premolars are two-rooted. The fourth upper premolar has a very small hinder lobe, and no lobe in front of the principal lobe, so that the tooth is very like the corresponding one of *Canis*, especially as the internal lobe is anterior in position, opposite the front part of the principal cusp.

Of the lower teeth, the front premolar is like that of *Galictis*. The first molar like that of *Mellivora*, but larger and especially lower, while the second molar is a small rounded tooth.

The brain[2] shows a distinct but small Ursine lozenge in front of a considerable crucial sulcus which is placed rather far back. The sagittal gyrus is much the widest of the three circumsylvian gyri. The crucial and calloso-marginal sulci run one into the other. The Sylvian fissure is oblique and relatively long.

Putorius[3].—This very large genus of small-sized mammals is very wide spread, inhabiting as it does not only the Nearctic and Palæarctic regions and the Indian Archipelago, but also Africa, north and south, and South America, including Brazil. There may be something like two dozen species. The body attains its maximum of length and the limbs their minimum. Here for the first time we meet with species (*P. vulgaris* and *P. erminea*) common to the old and new worlds. The feet are more or less hairy beneath, especially the hinder part of tarsus. Habit digitigrade. The nose bears a median vertical groove.

The Mink (*P. vison*) is aquatic in its habits.

There may be from 13 to 16 dorsal and 5 or 6 lumbar, the dorsal and lumbar vertebræ together varying from 19 to 21.

The lumbar region is at its maximum of relative length amongst Arctoids, and the dorsal region almost at its minimum. The limbs are at their minimum length as compared with the spine, as are also the femur, tibia, and metacarpus. The length of the palate, and the breadth of the zygomata, compared with the length of the skull, are also at their minimum.

The infraorbital foramen is larger relatively than in *Mustela*, and the mastoid and paroccipital processes are still more indistinct[4].

[1] P. Z. S. 1869, p. 39, *Martes*. [2] *L. c.* p. 17.

[3] This is *Mustela* of Aldrovandus, Ray, Klein, Schreber, Gmelin, Desmarest, Lesson, Fischer, Bell, Gray, and Coues, see 'Fur-bearing Animals,' p. 102. It also includes the *Gale*, *Gymnopus*, *Lutreola*, *Neogale*, and *Vison* of Gray. It is the *Putorius* of Cuvier, Brandt, Gray, Richardson, Audubon and Bachman, Coues, P. Gervais, and others.

[4] For other cranial characters see Flower, P. Z. S. 1869, p. 13 & fig. 4.

The angle of the mandible is hardly more marked than in *Arctonyx*.

Molar formula = P. $\frac{3}{3}$, M. $\frac{1}{2}$.

The cusps are somewhat sharper than in *Mustela*. The upper sectorial has its inner cusps less anteriorly placed and the lower sectorial has its inner cusp more rudimentary.

The brain [1], though very little convoluted, as is the rule in the smallest mammals of each group, shows a distinct, though minute, Ursine lozenge. The crucial and calloso-marginal sulci run into one another. The sulcus separating the sagittal and parietal gyri is less produced posteriorly than in other Carnivora. The Sylvian fissure is oblique and relatively long.

Pœcilogale.—This small South-African genus, coloured like the Zorilla, has been founded by Mr. O. Thomas [2] on the *Mustela albinucha* of Gray [3]. Its molar formula: P. $\frac{2}{2}$, M. $\frac{1}{1}$, rarely $\frac{1}{2}$. It has the smaller number in all the British Museum specimens examined by Mr. Thomas, but the second minute lower true molar is present in the specimens in the Paris Museum. The auditory bullæ are perfectly flattened.

Lyncodon [4].—This and the last genus are the Arctoids with the smallest number of teeth and most feline dentition, whence the name of this genus. The animal comes from Patagonia. Mr. O. Thomas considers that it may merely be an aberrant southern form of *Putorius brasiliensis*. Its skull is quite like that of *Putorius*, but the bullæ are unusually inflated.

Molar formula = P. $\frac{2}{2}$, M. $\frac{1}{1}$.

Its external form has been unknown till recently. C. Vogt describes as follows skins from Patagonia preserved in the Museum of Geneva:—"L'animal est une vraie belette un peu plus grande que l'hermine. Le corps a 30 cent. de long, la queue 9 cent. La fourrure est rude, grossière, formée de longs poils clairsemés d'un brun rouge clair avec des pointes blanchâtres sur le dos, les flancs et la queue. Le dessus de la tête est d'un blanc jaunâtre sale, et cette teinte se continue en arrière des deux côtes par-dessus les oreilles en deux pinceaux-pointus, formés de poils très longs couchés sur les côtés du cou. L'animal a l'air de porter un baschlik à coins rejetés en arrière. La nuque et le dessus du cou sont, comme la gorge et les pattes, d'une teinte brune assez foncée. La queue porte des poils très longs réunis au bout en pinceau.

"La tête est courte, le museau tronqué, les oreilles très petites, arrondies et larges, les pieds pentadactyles, à courtes griffes très

[1] *L. c.* p. 17.

[2] Ann. & Mag. Nat. Hist. (1883) p. 370, where see the woodcuts of skull and dentition.

[3] See Cat. Cuvier, B. Mus. p. 91; also P. Z. S. 1864, p. 69, pl. 10; and P. Z. S. 1865, p. 114.

[4] See d'Orbigny, Amer. Merid.; also P. Gervais, Mus. ii. p. 115; A. Doering, Zoologia, Buenos Ayres, 1881; O. Thomas, Ann. & Mag. Nat. Hist. (1883) p. 370; and Carl Vogt, Mammifères (1884), p. 244.

acérées. Les pieds antérieurs sont semi-digitigrades, les postérieurs plantigrades."

Gulo[1].—This Bear-like musteline form consists of but one species, which ranges over the extreme north of both continents—Siberia, Russia, Scandinavia, Canada, only to the extreme north of the United States towards the Atlantic but down possibly to Northern California in the Western region. It has very small ears, inconspicuous, and hairy on both sides, very small eyes, a naked muzzle with groove and very hairy palmar and plantar surfaces with small pads amongst the hairs. A short tail, about the length of the head, clothed with long hairs; the feet are large and the habit semiplantigrade.

Its ferocity appears to have been exaggerated, and Audubon and Bachman speak of having seen one which was so gentle that the owner of the show, in which it was confined, took it out and opened its mouth " to enable us," they say, " to examine its teeth, and it buried its head in our lap while we admired its long claws and felt its woolly feet." It had been taught to sit on its haunches and hold a pipe in its mouth. It was adverse to the light of the sun, and seemed attached to a Marmot in the same cage. The same authors say that it feeds principally on the carcases of beasts killed by accident, and destroys disabled quadrupeds, eating also Marmots, Mice, and other rodents. They deem the assertion that it attacks large healthy game incredible. But it is after all a formidable beast, and bold dogs would not enter its burrow a second time. Richardson saw one chasing a Hare which was being, at the same time, harassed by a Snowy Owl. The Glutton, however, was much too slow in its movements to catch it. Captain Ross says that in midwinter it climbed the snow-wall round his vessel and came on deck, where, undismayed by the presence of a dozen men, it seized a canister of meat, which it ate so ravenously that it allowed itself to be snared by a noose and strangled.

There are 14 or 15 dorsal, 5 lumbar, 3 sacral, and 15 or 16 caudal vertebræ. The metacarpus is at its maximum relative length amongst Arctoids, and indeed amongst Carnivores if we except Cynoid and *Hyænidæ*. The inner condyle of the humerus is perforated[2].

[1] *Gulo*, Gesner, Quad. Vivip. (1551) p. 623; Aldrovandus, Quad. Dig. (1645) p. 178.
Mustela gulo, Linn. S. N. i. (ed. 10, 1758) p. 45, no. 3; Erxl. Sys. Ann. (1777) p. 477, no. 15.
Ursus gulo, Schreber, Säug. iii. (1778) p. 525, pl. 144, 144*a*.
Meles gulo, Pallas, Spic. Zool. xiv. (1782) p. 25, pl. 2.
Gulo borealis, Wagn. Supp. ii. (1841) p. 246; Gray, P. Z. S. 1865, p. 120; Cat. Carniv. B. Mus. 98.
Gulo arcticus, Desm. Mamm. i. (1820) p. 174; Less. Mamm. p. 142; Fischer, Syn. p. 154.
Gulo luscus, Richardson, F. B. A. I. 1829, p. 41; Fisch. Syn. p. 154; Audubon & Bachman, Quad. N. A. I. p. 202, pl. 26; Baird, N. A. Mamm. p. 181; Sabine, 'Supp. Parry's 1st Voyage,' p. 184; Coues, Fur-bear. An. p. 34; P. Gervais, Mamm. ii. p. 108; Buffon, H. Nat. xiii. p. 278, & Supp. iii. 240, pl. 48; De Blainville, Ostéog. *Mustela*.

[2] Owen, Anat. of Vertebrates, vol. ii. p. 509.

The cranial characters have been, in the main, given by Prof. Flower[1]. Besides these it may be noted that the outline of the skull seen in profile has a rather striking resemblance to that of some of the larger Cats. The muzzle is very broad, more so relatively than in any Arctoid yet noted except *Conepatus* and *Ailurus*.

It is prolonged backwards behind the last molars, though hardly more so than in *Mellivora*, and it has not so definite a lateral boundary as in the latter, though the pterygoids show a tendency to descend below the general level of the palate[2]. The maxilla forms but a small floor to the orbit. The zygomata extend much outwards, owing to the breadth of the glenoid surfaces. The sagittal ridge is much as in *Mellivora*. The glenoid foramen is very large.

A slight ridge connects the paroccipital and mastoid processes, and the latter, though conspicuous, does not depend below the meatus auditorius externus. The stylo-mastoid foramen is very conspicuous. The infra-orbital foramen is moderate or rather small. The angle of the mandible is little conspicuous and is pressed upwards, though not so much so as in *Arctonyx* and *Mydaus*.

Molar formula=P. $\frac{4}{4}$, M. $\frac{1}{2}$.

The dentition considerably resembles that of *Mellivora*, as to the form of teeth, not of course as to their number.

The outermost upper incisor, however, is very large and canine-like. The fourth upper premolar is relatively larger than in *Mellivora*—especially its hindmost cusp; the first upper molar is a little more equal in length externally and internally than is generally the case in the last-mentioned genus. The fourth lower premolar has only one hinder cusp and that smaller—thus resembling *Galictis*. The first lower true molar is larger than in *Mellivora*. There is a very small heel and no inner tubercle. There is a second true molar, which is a small, rounded tooth. The dentition is very sectorial, at once more sectorial and powerful than in any other Arctoid. It may therefore be interesting to compare its dentition with that of one or two other specially predacious carnivora.

Gulo *compared with* Felis—has the incisors relatively larger. The third upper premolar is rather smaller with the main cusp less relatively produced, the fourth upper premolar, or upper sectorial, has its fore-cusp smaller, its hind cusp large and more equal in development to the mid-cusp, and the internal cusp larger. The first true molar is also much larger.

In the lower jaw the third premolar is less trilobed than in *Felis* and its principal lobe is less developed. The sectorial, or first true molar, differs by having a large heel, and in having the two principal cusps less lofty. There is a second true molar.

Gulo *compared with* Hyæna *and* Felis.—The incisors are not so large relatively as in *Hyæna*, and the other ones are less preponderating. In these respects *Gulo* is more like *Hyæna* than *Felis*. The third upper premolar is much smaller relatively. The hind cusp is less marked and little produced. The fourth premolar has

[1] P. Z. S. 1869, p. 12.

[2] See above, p. 373.

its fore cusp *much* smaller, the Hyæna's being larger relatively than in *Felis*. The relative proportions of the mid and hind cusps in *Gulo* are much as in *Hyæna*. The internal cusp is not so big relatively as it is in *Hyæna*, though it is more like that of *Hyæna* than that of *Felis*. The first molar is a little larger than in *Hyæna*, which is intermediate between *Gulo* and *Felis* as regards the development of this tooth.

In the lower jaw the fourth premolar is less trilobed and the principal lobe is less developed. The sectorial has a large heel. There is a second true molar.

Gulo *compared with* Cryptoprocta, Hyæna, *and* Felis.—In the upper jaw the third premolar of *Cryptoprocta* is intermediate in form between that of *Felis* and that of *Gulo*, but is more like that of the former. The same is the case as regards the upper sectorial, both as regards the three external cusps and the inner cusp. The first upper molar of *Cryptoprocta* is also intermediate in its development, but is much more Cat-like than Glutton-like. In the lower jaw the canine of *Cryptoprocta* is more like that of *Felis* than is the case with the canine of *Hyæna*. The fourth premolar has a less trilobed crown in *Gulo* than in *Cryptoprocta*. The sectorial has a small heel, but not like that of *Gulo*, and the last genus alone of the three has a second true molar.

Gulo *compared with* Canis.—In the upper jaw the third premolar is smaller, and has a smaller posterior cusp. The sectorial is very like that of *Canis*, but the hindmost cusp is rather thicker transversely. *Gulo* has a much smaller first true molar and no second one.

In the lower jaw, the fourth premolar is less trilobed, or rather less quadricuspidate, this tooth of the Dog being much like that of the Hyæna. The sectorial of *Gulo* has a smaller heel and the mid cusp predominates less over the fore cusp. The second true molar is much smaller and there is no third molar.

The brain [1] shows an elongated Ursine lozenge. The cerebrum is very wide posteriorly and its dorsal surface is much complicated, the anterior limb of the sagittal gyrus being greatly expanded and convoluted, while posteriorly it is medianly grooved.

Lutra [2].—The Otters, of which there are at least nine, possibly a dozen species (of very uniform coloration), are found over all the geographical regions except the Australian. No species, however, appears to be common to the Old and New Worlds. It is therefore the most cosmopolitan genus of Arctoids we have yet met with. The external characters of the genus are familiar, but it may be noted that the muzzle has no central groove or only a trace of it at

[1] See *l. c.* p. 17.

[2] Erxleben, Syst. n. 448; Schreb. Säug. iii. p. 457, pl. 126 *a*; Desm. Mamm. p. 188; Bell, Brit. Quad. p. 129; Buffon, Hist. Nat. vii. p. 134, pl. 11–17; Wagner's Supp. ii. p. 249; P. Gervais, Mamm. ii. p. 116; Gray, P. Z. S. 1865, p. 126; Cat. Carnivora B. Mus. p 100; De Blainville, Ostéog. *Mustela*; Linn. S. N. i. p. 66 (*Mustela lutra*); Pallas, Zoogr. i. p. 76 (*Viverra lutra*). Under this genus are also included Gray's genera *Barangia, Lontra, Nutria, Latronectes, Hydrogale, Latax, Pteronura*. See Cat. Carnivora of Brit. Mus. pp. 100–113.

the lower margin of the nasal pad. The ears are small, rounded, and simple. The palmar and plantar surfaces may be naked or more or less hairy, according to the species.

The tail may have (as in the exceptional form *L. sendbachii*[1]) a prominent ridge along either side of the tail, and the feet may approximate in form to those of *Enhydra*.

There are 14 or 15 dorsal, 6 or 5 lumbar, 3 sacral, and from 20 to 26 caudal vertebræ. Both the humerus and radius are at their minimum of relative length in the whole of the Carnivora, as also is the relative breadth of the skull behind the orbits.

The skull is so long that, though the palate is broad, its length compared with its breadth is greater than in any other Arctoid; and the excess of the length of the pelvic limb over the pectoral is only exceeded by that of *Enhydra* amongst the whole of the Carnivora.

The hyperapophyses on the cervical vertebræ are longer than in any form yet noticed. The are twelve quasi chevron bones to the tail. Each consists of a pair of diverging hypapophyses, which tend, irregularly, to send out mesiad processes below. Each pair depends from the preaxial end of its centrum, beginning at the fourth caudal vertebra.

The scapula develops a very strong metacromion process, while the acromion is very slender. The preaxial margin of the scapula is exceedingly convex. The humerus may or may not have a supracondyloid canal. The supinator ridge is very strongly marked. The ulna develops a distinct process from the middle of its shaft, which process abuts against the radius. The ultimate phalanges of the manus are exceedingly short. The femur has a very strong external trochanteric ridge extending down its shaft. The ultimate phalanges of the pes are of about the same length as those of the manus.

To the cranial characters given by Prof. Flower[2] may be added the following:—The skull is much flattened superiorly. The ascending process of the premaxilla does not, so far as I have seen, reach the frontal. The maxilla develops a rudimentary preorbital process[3]. Venous channels traverse the exoccipital, and open on the inner side of either occipital condyle[4]. The meatus auditorius externus is relatively small. The foramen condyloideum is conspicuous. The mastoid process is concave beneath, and does not descend below the meatus auditorius externus. No ridge connects it with the paroccipital process. The palate is not greatly prolonged behind the last molars. The pterygoids descend below the level of the palate. The internasal septum does not extend back to the hinder margin of the palate. The zygomata, though slender, are rather strongly arched outwards. There are both malar and frontal

[1] This is the type of Gray's genus *Pteronura*. See P. Z. S. 1865, p. 131, 1868, p. 66, and Wiegmann's Archiv, iv. p. 392 (1839).

[2] See P. Z. S. 1869, p. 11.

[3] A rudiment of that which is found amongst the Pinnipedia.

[4] Another approximation to the characters of the Pinnipedia.

postorbital processes, though the latter may be very slightly marked or strongly so. The skull is extremely pinched in behind the orbits. There is a large sagittal and very large lambdoidal ridge. The skull is extremely broadened out behind, but the muzzle is very short. The postglenoid process is much developed, and tends to hold the mandible as in the Badger. The basioccipital is very thin, and defect of ossification may exist in it and in the exoccipitals. The rhinencephalic fossa is also shallower than heretofore[1]. The crista galli is large. The turbinals are very large and complex. The infraorbital foramen is enormously large. The angle of the mandible is much as in *Meles* but rather strongly everted, the ascending ramus being very concave externally.

Molar formula $=$ P. $\frac{4}{3}$, M. $\frac{1}{2}$.

The middle incisor of each ramus of the mandible is placed behind the other two. The upper sectorial and molar are much like those of *Helictis*[2], save that the antero-internal cusp of the former is smaller. The lower molar teeth are also much like those of *Helictis*, except that the second true molar is a little larger relatively.

In the upper jaw the first premolar is minute; the second and third, each simple and conical, but greatly increasing in size, and with an external cingulum; the fourth has three external cusps, of which the median one greatly predominates, and an external cingulum. There is a very large internal cingulum embracing the postero-internal part of the tooth, which is two thirds the length of the external part. The upper molar has two external cusps and a small external cingulum, with one internal principal cusp, and a large internal cingulum, which may develop another internal cusp.

In the lower jaw all the grinders have an external cingulum. The three premolars are pretty simple and conical, successively increasing in size backwards. The sectorial has two external and one internal principal cusps, with a large talon developing small accessory cusps. The second molar is small and rounded.

The tongue has the papillæ which clothe it pretty uniform in size, except that the flattened papillæ are elongated and rather conspicuous. There are five circumvallate papillæ forming a V, open forwards.

Of the salivary glands the parotid is thin, and the submaxillary is larger than the parotid; it is, indeed, large and bilobed.

The larynx has the thyroid cartilage rather sharply notched, medianly below.

The lungs have the form usual in the Carnivora.

The diaphragmatic aspect of the liver is very like that presented by *Nasua*, as also is that of its abdominal aspect, save that the Spigelian lobe is subdivided and the caudate large, and especially longer.

The kidney differs greatly from that of all Arctoids yet described, and from that of all non-Arctoid Carnivores. Instead of being single, with one mamilla, it is lobulated, each of the many lobes being a little kidney in itself, with one mamilla.

[1] Other Pinniped characters.

[2] See *anteà*, p. 374.

The brain[1] is, of course, wide behind, as is the skull which holds it; its dorsal surface is very complicated, but exhibits a rather faintly marked Ursine lozenge placed rather far back. The anterior limb of the Sylvian gyrus is very much narrower than its posterior limb. The Sylvian fissure is very long and extremely oblique. The crucial and calloso-marginal sulci appear to join.

As similarity of habit often produces, or coexists with, similarity of structure, thus giving rise to independent resemblances which are no sign of genetic affinity, it may be interesting to compare the structure of the Arctoid aquatic Carnivore, *Lutra*, with that of the Æluroid aquatic Carnivore, *Cynogale*. In this instance similarity of habit has gone very little way in evolving similarity of structure, for, in addition to the divergences as to the form of the *basis cranii* and as to other points which differentiate the Æluroids and Arctoids, the two former exhibit the following divergences:—

The Æluroid Otter, *Cynogale*.	The Arctoid Otter, *Lutra*.
Neck more than a fourth the length of spine from atlas to end of sacrum.	Hardly more than a fifth.
Tail little more than half such length of spine.	More than eight tenths.
Humerus and radius together more than one third such length.	Hardly more than one quarter.
Pectoral limb to spine at 100 =55·5.	= 39·5.
Pelvic limb =68·4.	= 50·9.
Cranial length =29·5.	= 18·8.
Relative length of palate =16·0.	= 8·5.
Interorbital breadth =4·1.	= 1·9.
Therefore skull much pinched in behind orbits.	Extremely so.
Muzzle very long.	Muzzle very short.
Zygomata very strong.	Rather slender.
Cranium not very broad posteriorly.	Very broad posteriorly.
Lambdoidal ridge very large.	Moderate.
Rather large infraorbital foramen.	Infraorbital foramen very large indeed.
Nasals long and narrow.	Nasals short and broad.
Premaxillæ slender.	Premaxillæ very broad.
Cribriform plate rather narrow.	Cribriform plate rather broad.
Scapula quadrate.	Anterior margin very convex.
Humerus rounded anteriorly.	Produced into a sharp eye anteriorly.
Inner condyle moderate, and not perforated.	Inner condyle very large and perforated.
An intercondyloid perforation.	No intercondyloid perforation.
Radius with no median process to join ulna.	Radius with a median process to join ulna.
Femur considerably larger than humerus.	Very slightly so.
Tibia of about the same length as the femur.	Tibia decidedly larger than femora.
Anterior molars much elongated.	Not so.
First upper premolar large.	Very small.
First inferior true molar not sectorial.	Sectorial.
Second inferior true molar two thirds the length of the first.	Not half the length of the first.

[1] See *l. c.* p. 20.

Aonyx[1].—This small genus of the species from Nepal, Java, Sumatra, and South Africa, differs from *Lutra* in its rudimentary or even obsolete claws, and in having the feet only slightly webbed. The palmar and plantar surfaces are quite naked, or at most have but a few scattered hairs.

There are 14 dorsal, 6 lumbar, 3 sacral, and 20 caudal vertebræ. The ultimate phalanges of the manus and pes are much shorter relatively than in any other Arctoid. The breadth of the brain-case, compared with the length of the skull, is at its maximum amongst Arctoids, as is the length of the first lower true molar.

Caudal vertebræ with hypapophyses depending from the hinder end of the centrum of the first and of the second vertebræ and from the front end of the centrum of the third vertebra and of the succeeding vertebræ to the tenth. Three real chevron bones are placed beneath the intervals of the vertebræ, between the third and the sixth.

The humerus has a condyloid canal. The radius develops no process from the ulna. The acromion is very slender. No special ectotrochanteric ridge to femur. Ultimate phalanges exceedingly minute; those of pes slightly lower than those of manus.

The skull resembles that of *Lutra*, save that it is less flattened, especially the bullæ. The cranial ridges are generally smaller, as are the mastoid and paroccipital processes. The pterygoids tend less to depend. There are no defects of ossification in the exoccipitals.

Molar formula $=$ P. $\frac{4 \text{ or } 3}{3}$, M. $\frac{1}{2}$.

The true molars are more massive than in *Lutra*. The first upper molar is large relatively and more preponderating over the fourth premolar.

Enhydra[2].—This very peculiar genus, containing only a single

[1] Lesson, Mamm. p. 157; Fischer, Synop. p. 228; P. Gervais, Mamm. ii. p. 118; Gray, P. Z. S. 1865, p. 129; id. Cat. Carniv. B. Mus. p. 109; Horsfield, Zool. Research, vii.; Raffles, Linn. Trans. xiii. p. 254; De Blainville, Ostéogr. *Mustela*.

[2] *Mustela lutris*, Linn. Syst. Nat. i. (1758) p. 45, no. 1; Schreber, Säug. iii. (1777) p. 128; Gmelin, Syst. Nat. i. (1788) no. 1.

Mustela, De Blainville, Ostéographie.

Phoca lutris, Pallas, Zoog. Rosso-As. i. (1831) p. 100, no. 34.

Lutra lutris, Gray, P. Z. S. 1865, p. 136, pl. vii. and Cat. Carniv. B. Mus. p. 118.

Lutra marina, Steller, Nov. Ann. Petrop. ii. (1751) p. 367, tab. xvi.; Erxleben, Syst. Nat. (1777) p. 445; Schreber, Säug. iii. (1778) p. 465, pl. cxxviii.; Desm. Mamm. i. (1820) p. 189; Harlan, Faun. Amer. (1825) p. 72.

Lutra stelleri, Lesson, Mamm. (1827) p. 156, no. 423.

Enhydra marina, Fleming, Philos. Zool. ii. p. 187; Martin, P. Z. S. (1836) p. 59; Aud. & Bachman, N. A. Quad. iii. p. 170, pl. cxxxvii.; Baird, M. North Am. (1857) p. 189.

Enhydris marina, Licht. Darstell. Säug. (1827) p. 34, pls. 49 and 50; Wagner's Supp. ii. p. 268; P. Gervais, Mamm. ii. p. 119.

Enhydris stelleri, Fischer, Syn. (1829) p. 229.

Enhydris lutris, Coues, Fur-bear. Anim. p. 326.

Lutra (Enhydra) marina, Richardson, F. B. Am. i. (1829) p. 59, no. 21; id. Zool. Beechey's V. (1839) p. 5.

species, is confined to the coasts and islands of the North Pacific, descending south, on the American side, as far as Lower California. The ears are very small and very low down, but little above the line of the mouth. The whiskers are few, short, and stout. The muzzle is naked at the end, and has a vertical groove traversing part of it. The fore feet are wonderfully small, with very short digits, short, curved claws, and naked palms. The hind feet are very long, with very long digits webbed to their tips, and with hairy soles, and short, stout, curved claws. The tail is stout.

There are 14 dorsal, 6 lumbar, 4 sacral, and 21 caudal vertebræ.

As to the proportions of the skeleton, the cervical region is at its minimum length (compared with the spine) amongst Arctoids save *Cercoleptes*, also the length of the palate is at its minimum, as is the breadth of the skull behind the orbits. The length of the first upper molar, compared with that of the skull, is at its maximum amongst all Carnivores, as is also its breadth and to a yet greater degree. The length of the pelvic limb over that of the pectoral limb is greatly in excess of that found in any other Carnivore.

The cervical vertebræ have moderate hypapophyses. The thorax is very capacious. The caudal region is short and without chevron bones. The acromion is short. The humerus has a condyloid canal. The femur is very short. The digits of the feet are very unlike those of any other Arctoid. Those of the manus are indeed short and nearly equal in length; but those of the pes are very elongated, and are flattened like those of Seals. The fifth is the longest. The length of the metatarsals of the individual measured, and the other dimensions of which are given in the tables annexed, are as follows:—Of the first, 8″ 8‴; of the second, 11″ 5‴; of the third, 13″ 2‴; of the fourth, 14″ 4‴; and of the fifth, 15″. The fifth is the stoutest as well as the longest.

As to the cranial characters, in addition to those given by Professor Flower[1] it may be noted as follows:—The maxilla forms a very large floor to the orbit, and there are venous canals, inside the ex-occipitals, which open inside the condyles. There are, occasionally, defects of ossification in the exoccipitals. The occiput inclines forwards and upwards. The basis cranii is very much broadened out and flattened. The postorbital processes are less marked than in *Lutra* and *Aonyx*. The nasal aperture is extremely large, and there is hardly any rhinencephalic depression, the wide, large cribriform plate lying flush with the general inner wall of the skull. The angle of the mandible is much as in *Meles*. The subangular margin is everted, but not so much so as in *Lutra*.

Dental formula=I. $\frac{3}{2}$, C. $\frac{1}{1}$, P. $\frac{3}{3}$, M. $\frac{1}{2}$.

It differs from every other Carnivore except the extinct *Eusmilus*[2]

Sea Otter, Penn. Syst. Quad. (1771) p. 241; Cook's Third Voyage (1784) ii. p. 295, pl. 43.
Saricorienne, Buffon, Supp. vi. p. 287.

[1] P. Z. S. 1869, p. 11. [2] See 'The Cat,' p. 438, fig. 190.

in having only four lower incisors. The molars all have their tubercles curiously rounded. The fourth upper premolar has the antero-posterior length of its inner and outer sides more equal than heretofore, and has two central subequal cusps and two inner ones, whereof the anterior is very much indeed the larger. There is also an internal cingulum. The first upper true molar is shaped like that of *Taxidea*, only that it has a less predominantly broadened villus, and that all its tubercles are rounded; it has a small external, and an exceedingly large internal, cingulum. It has also two external cusps, whereof the anterior is the larger, and three internal ones.

The lower molars are similar to those of *Lutra*, only they are more broadened out and flattened and have more rounded tubercles. The first lower true molar has a small anterior cusp, then two large ones, one external and one internal, followed by a large talon. The second true molar is broader than long.

In the milk-dentition the first upper deciduous molar is a very small, conical tooth. The second is more sectorial than is the third premolar, having no postero-internal tubercle or any internal cingulum. It has one anterior cusp, with a pair of cusps (one internal and the other external) behind it. The third deciduous molar is very like the fourth premolar, but it has a relatively bigger internal cingulum and a large postero-internal tubercle, and thus it so far approximates towards the form of the first upper true molar. The third deciduous inferior molar is more Otter-like than is the fourth lower premolar, but it has a larger (especially broader and above all posteriorly broader) talon, which forms rather more than half of the entire tooth. The three outer cusps, however, are blunter than in *Lutra*, though they are not so blunt as are the permanent molars of the adult animal.

The brain[1] differs from that of *Lutra* in having the crucial sulcus placed more forwards, and the Ursine lozenge larger and more conspicuous.

Ursus[2].—This well-known genus of about ten species ranges from the Arctic region southwards. For the main part confined to the Palæarctic and Nearctic regions, it descends to Africa north of the Sahara, to Ceylon and the Indian Archipelago, and to Peru and Chili. The genus is, however, entirely unrepresented in the Australian and Ethiopian region, and has only one species (*U.*

[1] P. Z. S. 1869, p. 20.

[2] See Albertus Magnus, de Anim. lib. xxii. p. 183; Linn. S. N. 169; Pallas, Zoogr. Ross.-Asiat. i. p. 64; Gmelin, S. N. i. p. 100; Fischer, Syn. Mam. p. 143; Horsfield, Linn. Trans. xv. p. 332; Temm. Fauna Japonica; Desm. Mamm. p. 165; Richardson, F. B. Amer. i. p. 14; Raffles, Linn. Trans. xiii. p. 254; Schreber, Säug. p. 513; De Blainville, Ostéog. *Ursus*; Cuvier, Oss Fossiles, iv.; P. Gervais, Mamm. ii. p. 10; Wagner, Supp. ii. p. 130; Buffon, Hist. Nat. viii. p. 248, pl. 31–33, xv. p. 128, Supp. iii. p. 200, pl. 34; Baird, Mam. N. Am.; Gray, P. Z. S. 1864, p. 680; Cat. Carniv. Brit. Mus. p. 215; Sclater, P. Z. S. 1862, p. 361, pl. 32; 1864, p. 374, 1867, p. 817; Swinhoe, P. Z. S. 1863, p. 380; Hempr. & Ehrenb. Symb. Physicæ, i. t. i.; Radde, Mélanges Biologiques de St. Pétersb. iii. p. 677. The above genus *Ursus* includes the *Thalassarctos*, *Myrmarctos*, and *Helarctos* of Gray.

ornatus) in the Neotropical. No one species is common to the Old and New Worlds, with the exception of the White Bear (*U. maritimus*).

The palmar and plantar surfaces are naked save in *U. maritimus*. The ears are erect, rounded, and of moderate size. The eyes are small; the nose may or may not have a median vertical groove, according to the species.

There are 14 dorsal, 6 lumbar, 6 sacral, and from 8 to 10 caudal vertebræ. The number of the sacral vertebræ being thus double that of most other Arctoids, the relative length of the sacral region is at its relative as well as absolute maximum, and indeed at its maximum amongst all Carnivora, while the tail is at its relative Arctoid minimum. The length of the limbs relatively is also at the maximum amongst Arctoids after *Procyon*. The femur is also at its relative maximum amongst all Carnivora. The length of the fourth upper premolar and the breadth of the first true molar are also at their minimum compared with the length of the spine. The scapula has an elongated posterior angle, the femur is relatively slender as well as elongated. The inner condyle of the humerus is not perforated save in *Ursus ornatus* [1].

The more significant cranial characters of *Ursus* have been excellently described and figured by Professor Flower [2]. In the skulls I have examined I have found the premaxillæ and frontals touch, excluding the nasals from the maxillæ. The maxilla forms but an exceedingly small floor to the orbit, but it develops a rudimentary preorbital process.

The lateral margins of the basioccipital are each produced into an antero-posteriorly elongated descending process. The paroccipital and mastoid processes are connected by a slight ridge. The mastoid process descends below the meatus auditorius externus. The sagittal and lambdoidal ridges are moderate. The infraorbital foramen is small. The zygomata are well arched out and develop a malar postorbital process. There are marked postorbital processes to the frontals. The mandible is like that of *Ailurus*, the coronoid process not ascending much. The angle is long and slender, and extends backwards. There is a distinct subangular process.

Molar formula $=$ P. $\frac{4}{4}$, M. $\frac{2}{3}$.

P. $\frac{1+2+3}{1+2+3}$ are small, one-rooted, and deciduous, P. $\frac{2}{2+3}$ are especially deciduous.

Ursus differs from all other Arctoids except *Ailuropus* in having a third inferior true molar.

The grinding teeth are, as it were, those of *Procyon* developed through those of *Ailurus* in the *direction* of those of *Ailuropus*, but their modification is not carried so far as it is in the last-named genus. The fourth upper premolar (the sectorial) has only two external cusps and an internal cingulum, there being no internal cusp.

The first upper molar has four cusps, whereof the two outer are much the stronger.

[1] Owen's Anat. of Vertebrates, vol. ii. p. 508. [2] P. Z. S. 1869, p. 7.

There is a very faintly marked external cingulum and a very strong internal one. The second true molar has four cusps. Of these the two outer are the stronger pair, while the inner pair are more prolonged antero-posteriorly. There is a trace of an external cingulum. The internal cingulum is strongly developed. There is an elongated talon supporting irregular prominences somewhat like those found in *Ailuropus*.

The fourth lower premolar has one cusp, to which a small keel is annexed. The first molar is quinquecuspidate—one anterior, then two principal cusps (one within and the other without), followed by two cusps, side by side, on the heel. The second molar has four cusps (a pair external and a pair internal opposite each other), with one transverse ridge in front of the anterior pair, and another behind the posterior pair. The third lower molar is a rounded tooth, the crown of which has an irregular punctional surface very like that found on the molars of *Ailuropus*.

The thyroid cartilage is very strongly notched below medianly.

The tongue has a well-developed lytta [1], and is covered with small conical papillæ, amongst which larger fungiform papillæ are scattered. There are five circumvallate papillæ, forming a V-shaped patch as usual. The papillæ are larger in front of this patch. Behind it are flattened papillæ which have the form of large conical cones. The kidney is lobulated, each lobe being a small kidney in itself with one mamilla.

The brain [2] is richly convoluted. The Sylvian fissure is exceedingly long and exceedingly oblique. The sagittal gyrus is especially complicated, expanding greatly in front, and tends to be divided into two longitudinally. The parietal gyrus is simple and single. The Sylvian gyrus has its anterior limb exceedingly slender. The Ursine lozenge here attains its maximum of size and distinctness. The calloso-marginal and crucial sulci are separated by a continuation of the hippocampal gyrus forwards and upwards into the sagittal gyrus behind the crucial sulcus.

Melursus [3]. — This curious Indian species has an elongated snout which resembles that of *Mydaus*. It is naked, and has no median groove whatever. It has very extensile lips, and very elongated and curved blunt claws.

There are 15 dorsal, 5 lumbar, 5 sacral, and 11 caudal vertebræ.

The relative length of the skull is at its maximum amongst Carni-

[1] Cuvier, Leçons d'Anat. Comp. tome iv. 1re partie, p. 553.

[2] See *l. c.* p. 19, fig. 8.

[3] *Ursus labiatus*, Desm. Mam. p. 166; Foster, Syn. Mam. p. 144; Hodgson, J. A. S. B. i. p. 340, x. p. 910; P. Z. S. 1834, p. 9; Calcutta Journ. N.H. iv. p. 288; Wagner, Supp. ii. p. 148; P. Gervais, Mam. ii. p. 18.

Ursus longirostris, Tiedemann, Abh. über das vermeintl. bärenart. Faulthier, 1820; Reichenbach, N. A. Nat. Cur. xiii. i. p. 323, pl. xv.

Bradypus ursinus, Shaw, Zool. i. p. 159, pl. xlvii.

Prochilus ursinus, Illiger, Prod. p. 109.

Melursus labiatus, Meyer, Gray, P. Z. S. 1864, p. 699; Cat. Carniv. Brit. Mus. p. 237.

Ursus labiatus, De Blainville, Ostéog.

vores. The postorbital processes of the frontal are smaller than in *Ursus*. The palate is very broad, and much more prolonged behind the molars than in *Ursus*[1]. The zygomata are short and extend straight backwards and outwards without being arched outwards. Instead of lateral processes to the basioccipital there are processes of the temporal bones.

The teeth are relatively very small, and the first upper incisor is absent or soon falls away.

In the milk-dentition, the second and third molars both above and below are very small and simple. The fourth upper one has two outer cusps and a large internal cusp, with a minute cusp in front of the first of the two outer ones. It is much more sectorial than is the fourth premolar, which replaces it. The fourth lower molar has three outer cusps; the most anterior is very small, the next very high, and the third rather small. There is a fourth minute cusp inside the middle outer cusp and a fifth inside the third outer cusp, and slightly smaller than is the third cusp.

The tongue has a large lytta. Large fungiform papillæ are scattered all over the tongue's surface. The flattened papillæ are rather small and inconspicuous. The circumvallate papillæ are remarkable: there are two series of very conspicuous and very close-set papillæ, which together form a very obtuse angle.

The liver is very like that of *Nasua* or *Procyon*, only the right central lobe is rather smaller compared with the right lateral lobe, and the left central is very small.

The kidney is described in the Catalogue of the Royal College of Surgeons as having two mamillæ to each of its lobes.

The brain has the same characters as has the brain of *Ursus*.

Classification of the Arctoidea.

With good reason has Professor Flower remarked upon the difficulty of subdividing the great Arctoid group in a satisfactory manner. The characters most available for this purpose are the dental characters; but these are eminently adaptive ones, and would, taken alone, serve but to mislead the inquirer, as we have seen with *Proteles* and *Hyæna*, *Arctictis*, *Cynogale*, and *Cryptoprocta*, amongst the Æluroids.

The Bears form a small and very natural section, characterized not only by their peculiar dentition, but also by their complex kidneys and completely plantigrade feet.

Similarly the Otters, with their conglomerate kidneys and peculiar cranial structure, also form a small, well-marked group.

The Badger, with its caudal pouch and exceptional dentition, presents another type round which a few genera may be grouped, while the Raccoon and Coati form another section, to which *Bassaris* and *Bassaricyon* may be added, while *Cercoleptes* can, I think, find no other allies better suited for its adhesion than are these. The same I believe to be the case with *Ailurus*, but *Ailuropus* presents us with

[1] The palate in *Ursus* may be very little prolonged beyond the last molar, as in *U. ornatus*, no. 815 in the Museum of the Royal College of Surgeons.

a doubtful problem. It has the number of true molar teeth and the external form of the Bears, but it is less plantigrade. The condyloid foramina are minute instead of very large, and the basioccipital has the depressions separated by a crest, as in the Badgers, instead of being flat and wide, as in the Bears; and the bulla, instead of being wide and flattened, is slightly swollen out, but very small, as in *Ailurus*. Then there is no alisphenoid canal; while the glenoid foramen, so conspicuous in the Bears, is hidden at the bottom of a large notch between the bulla and the zygoma. The general form of the mandible also is much more like that of *Ailurus* than of *Ursus*. There is a fundamental resemblance also between the crowns of the teeth in *Ailurus* and *Ailuropus*, in spite of their exaggerated character in the latter genus; so that on the whole it appears to me that there is a more decided natural affinity between *Ailuropus* and *Ailurus* than between *Ailuropus* and *Ursus*.

The Weasels and their allies seem to be specially predacious variations of the Badger type; and I have no reason to urge (beyond the structure of the kidney) against the generally received view that the Otters are aquatic variations of the same type.

There will thus be three families, PROCYONIDÆ, MUSTELIDÆ, and URSIDÆ. The first of these is plainly subdivisible into two subfamilies—(1) *Procyoninæ*, and (2) *Ailurinæ*; while I agree with Professor Flower in dividing the MUSTELIDÆ into the three subfamilies—(1) *Melinæ*, (2) *Mustelinæ*, and (3) *Lutrinæ*.

These subdivisions may be synoptically characterized as follows:—

Fam. I. PROCYONIDÆ.

Kidneys simple. True molars $\frac{2}{2}$ or $\frac{2}{3}$, obtusely tuberculated. Dentition not sectorial. Alisphenoid canal present or absent.

Hab. America or Asia.

Subfamily 1. PROCYONINÆ.

True molars $\frac{2}{2}$. No alisphenoid canal. Molars not very complexly tuberculated.

Hab. America.

Procyon. *Bassaris.* *Cercoleptes.*
Nasua. *Bassaricyon.*

Subfamily 2. AILURINÆ.

True molars $\frac{2}{2}$ with an alisphenoid canal, or $\frac{2}{3}$ without an alisphenoid canal. Molars very complexly tuberculate.

Hab. Eastern Asia.

Ailurus. *Ailuropus.*

Fam. II. MUSTELIDÆ.

Kidneys mostly simple. True molars $\frac{1}{2}$ or $\frac{1}{1}$. Teeth tuberculate or sectorial. No alisphenoid canal.

Hab. Old and New Worlds.

Subfamily 1. Melinæ.

Kidneys simple. Feet elongated. Toes straight. Claws non-retractile, blunt, those of manus generally elongated. Dentition sectorial or not so. Habits mostly terrestrial and fossorial.

Meles.	*Mephitis.*	*Mellivora.*
Arctonyx.	*Conepatus.*	*Helictis.*
Taxidea.		*Ictonyx.*
Mydaus.		

Subfamily 2. Mustelinæ.

Kidneys simple. Feet short, partially webbed. Claws short, curved, often semi-retractile. Dentition sectorial. $\frac{\text{M. 1}}{}$ wide transversely. Habits terrestrial or arboreal.

Galictis.	*Mustela.*
Grisonia.	*Putorius.*
	Gulo.

Subfamily 3. Lutrinæ.

Kidneys conglomerate. Feet short and rounded (except hind feet of *Enhydra*). Toes webbed. Claws small, curved, blunt. Head broad. Molars large and quadrate. $\frac{\text{M. 1}}{}$ long as well as wide. Habits aquatic.

Lutra. *Aonyx.* *Enhydra.*

Fam. III. URSIDÆ.

Kidneys conglomerate. True molars $\frac{2}{3}$, longer than broad. Dentition not sectorial. An alisphenoid canal. Feet completely plantigrade.

Ursus. *Melursus.*

Generic Characters.

Procyoninæ.

$\frac{\text{P. 4}}{}$ sectorial				*Bassaris.*
$\frac{\text{P. 4}}{}$ not sectorial	Tail prehensile			*Cercoleptes.*
	Tail not prehensile	A proboscis		*Nasua.*
		No proboscis	Postorbital processes elongated. Body long	*Bassaricyon.*
			Postorbital processes short. Body short	*Procyon.*

Ailurinæ.

M. $\frac{2}{2}$ .... *Ailurus.*

M. $\frac{2}{3}$ .... *Ailuropus.*

MELINÆ.

- $\frac{\text{M. 1}}{}$ quadrate or very long as well as broad ....
  - Pig-like snout........................
    - $\frac{\text{M. 1}}{}$ very greatly exceeding $\frac{\text{P. 4}}{}$ in size .... *Arctonyx.*
    - Not very greatly... *Mydaus.*
  - No pig-like snout ...
    - Claws of manus enormous .... *Taxidea.*
    - Claws of manus not enormous ...
      - P. $\frac{2}{2}$ .... *Mephitis.* (Palate to last molar.)
      - P. $\frac{3}{3}$ .... *Conepatus.* (Palate produced beyond last molar.)
      - P. $\frac{4}{4}$ .... *Meles.* $\frac{\text{M. 1}}{}$ enormous.
- $\frac{\text{M. 1}}{}$ much broader than long ...
  - P. $\frac{4}{4}$ .... *Helictis.*
  - P. $\frac{3}{3}$ ....
    - M. $\frac{1}{1}$ .... *Mellivora.*
    - M. $\frac{1}{2}$ .... *Ictonyx.*

MUSTELINÆ.

- Feet plantigrade ....
  - Tail long. Nose with median groove ...... *Galictis.*
  - Tail short. No median groove to nose ...... *Grisonia.*
- Feet digitigrade ....
  - P. $\frac{4}{4}$; M. $\frac{1}{2}$ .... *Mustela.*
  - P. $\frac{3}{3}$; M. $\frac{1}{2}$ .... *Putorius.*
  - P. $\frac{2}{2}$; M. $\frac{1}{1}$ or $\frac{1}{2}$ .... *Pœcilogale.* (Bulla flattened.)
  - P. $\frac{2}{2}$; M. $\frac{1}{1}$ .... *Lyncodon.* (Bulla very conxex.)
- Feet large, plantigrade. P. $\frac{4}{4}$; M. $\frac{1}{2}$ .... *Gulo.*

LUTRINÆ.

I. $\frac{3}{3}$. Third phalanges not extremely short .... *Lutra.*

I. $\frac{3}{3}$. Third phalanges extremely short .... *Aonyx.*

I. $\frac{3}{2}$ .... *Enhydra.*

URSIDÆ.

Snout and claws not very much elongated............... *Ursus.*

Snout and claws very much elongated .... *Melursus.*

Comparison of the ARCTOIDEA *with the other* FISSIPEDAL CARNIVORA.

It would be superfluous to here again refer to the cranial or genital characters which differentiate the three suborders of the Carnivora. As to the dentition, the Arctoids alone of the existing forms present us in one genus with but four lower incisors, a condition also characteristic of the extinct Æluroid *Eusmilus*. They alone afford examples of upper true molars, which are broad and formed for crushing, and only in them do we find a fourth lower premolar, which is broad posteriorly. The dentition may nevertheless be extremely sectorial or more formed for crushing than in any other Carnivore; but the teeth are never so rudimentary as in *Proteles*. Only in them (*Grisonia*) do we find as many as sixteen dorsal vertebræ. They possess a brain which has a definite character in the almost constant presence of a dorsal patch limited incompletely by crucial and precrucial grooves, which have been called the "Ursine lozenge." While perineal glands are absent, we occasionally find a new glandular structure—a subcaudal gland, as in *Meles* and *Taxidea*.

Less exclusively terrestrial than the Cynoids, they are never so arboreal as are some of the Æluroids; but they present us with more fossorial genera, and with others perhaps more definitely modified for aquatic life than is the Æluroid *Cynogale*.

As to the coloration of this group, the Arctoids have frequently longitudinal markings, often of black and white, while they never show the spots or transverse bands which are found in many Æluroids.

All the Arctoidea are pentadactyle. There is a great difference between the Arctoidea and the other Carnivora as regards the vertical median nose-groove. Very rarely absent in the Æluroids, it is, as we have seen, absent in a good many genera of Arctoids, and sometimes, as in *Ursus*, present or absent in different species of the same genus. Only in the Arctoids, but almost always in them, the crucial and precrucial sulci define an "Ursine lozenge" on the surface of the cerebrum.

Distribution of the ARCTOIDEA.

This suborder extends all over the world except Australia, New Zealand, New Guinea and adjacent islands, Polynesia, Madagascar, the Antilles, and the Antarctic region.

The *Procyonidæ* are exclusively New-World forms, the *Ailuridæ* are exclusively Asiatic. The *Mustelidæ* and *Ursidæ* are cosmopolitan within the range of the suborder. The majority of the species and genera belong north of the equator.

No genera except *Ursus*, *Gulo*, *Mustela*, *Putorius*, and *Lutra* are common to the Old and New Worlds, and no species are common to them save *Gulo luscus*, *Putorius vulgaris*, *Putorius erminea*, and *Ursus maritimus*. The genera common to Asia and Africa are *Mustela*, *Putorius*, *Lutra*, *Ursus*, *Mellivora*, and *Aonyx*. The genera peculiar to Africa are *Ictonyx* and *Pœcilogale*. The genera peculiar to Asia are *Ailurus*, *Ailuropus*, *Helictis*, *Arctonyx*, *Mydaus,* and *Melursus.* The genera peculiar to America are *Procyon, Nasua, Cercoleptes, Bassaris, Bassaricyon, Taxidea, Mephitis, Conepatus, Galictis, Grisonia, Lyncodon,* and *Enhydra.* The genera peculiar to the Old World are those already enumerated as peculiar to Asia and to Africa respectively, with the addition of *Mellivora, Aonyx,* and *Meles.* There are thus eleven exclusively Old-World and twelve exclusively New-World genera. The Ethiopian and Neotropical regions are poor in Arctoids, as is also the Indian Archipelago.

TABLE I.

	Number of dorsal vertebræ.	Number of lumbar vertebræ.	Number of sacral vertebræ.	Number of caudal vertebræ.	Length of cervical vertebræ.	Length of dorsal vertebræ.	Length of lumbar vertebræ.	Length of sacrum.	Length of caudal vertebræ.	Length from front of atlas to hinder end of sacrum.
Canis dingo	13	7	3	19	″ 16·5	″ 29·0	″ 13·5	″ 3·8	″ 32·3	″ 62·8
Procyon	14	6	3	16–20	6·2	15·3	10·5	4·5	28·5	36·5
Nasua	14	6	3	19–23	6·5	15·5	10·0	3·5	33·0	35·5
Cercoleptes	14	6	3	26	5·0	14·5	12·9	4·4	42·5	36·8
Ailurus	14	6	3	18	8·2	18·6	12·2	4·0	45·5	43·0
Bassaris	13	7	3	23?	5·6	10·5	8·0	2·1	?	26·2
Meles	15[14]	5	3	18	8·7	25·8	10·8	3·7	19·2	49·0
Arctonyx	16	4	4	15–20	12·5	30·0	11·0	6·0	27·5	59·5
Taxidea	15	5	3	14?	7·6	21·7	9·2	3·8	19·6	42·3
Mydaus	14[15]	6 [5]	3	12	4·2	11·1	6·8	2·0	9·0?	24·1
Mephitis	16	6	2	21	5·0	12·5	6·5	1·7	21·4	25·7
Conepatus	16	4	3	18	4·7	13·8	5·5	2·5	20·7	26·5
Mellivora	14	4 or 5	4 or 3	15 or 16	11·0	23·4	8·8	4·8	19·3	48·0
Helictis	14	6	3	18	4·7	11·0	6·8	1·8	17·8	24·3
Ictonyx	15	5	2	23	3·6	9·7	4·4	0·8	20·3	18·5
Galictis	14	6	3	23	9·2	19·8	11·1	3·7	37·5	42·8
Grisonia	16	5	3	21	6·8	17·0	7·0	2·0	17·5	32·8
Mustela	14	6	3	18–23	5·8	12·8	9·0	2·0	?	29·6
Putorius	15–13	5–6	3	16	2·7	5·0	3·8	0·8	4·4	12·3
Gulo	14–15	5	3	15	12·0	27·6	13·0	4·1	25·5	56·7
Lutra	14–15	6 [5]	3	20–26	12·5	28·1	16·1	3·8	49·5	60·5
Aonyx	14	6	3	20	5·8	15·2	9·3	3·3	29·0	33·6
Enhydra	14	6	4	21	8·5	29·8	17·0	6·7	33·6	62·0
Ursus horribilis...	14	6	6	9	26·5	46·5	27·0	17·0	17·5	117·0
Melursus	15	5	5	11	17·0	36·0	16·5	10·5	20·8	80·0

TABLE II.

	Length of pectoral limb (humerus, radius, and manus).	Length of pelvic limb (femur, tibia, and pes).	Length of humerus (head to capitellum).	Length of radius (head to root of styloid process).	Length of femur (head to condyloid surface).	Length of tibia to root of malleolus.	Length of 3rd metacarpal.	Length of 3rd metatarsal.	Length of ultimate phalanx of 3rd digit of manus.	Length of ultimate phalanx of 3rd digit of pes.
Canis	″ 43·0	″ 49·3	″ 15·0	″ 15·5	″ 17·0	″ 16·8	″ 5·8	″ 6·7	″ 1·6	″ 1·5
Procyon	27·2	33·5	10·0	10·5	11·8	12·4	2·8	3·9	1·0	1·0
Nasua	22·5	29·0	9·0	8·2	10·8	10·3	2·3	3·0	1·5	1·3
Cercoleptes	20·2	24·1	8·1	6·4	8·9	8·2	1·9	2·5	1·0	1·0
Ailurus	29·7	33·5	12·0	9·0	12·0	11·5	3·35	3·7	1·1	1·1
Bassaris	14·7	17·5	5·9	4·6	6·6	6·3	0·7	1·9	1·7	0·6
Meles	26·1	30·5	9·7	8·7	11·5	9·7	2·8	3·3	1·8	1·2
Arctonyx	29·5	32·5	11·0	9·0	12·7	10·5	3·3	3·5	2·1	1·4
Taxidea	27·1	27·1	9·7	7·9	10·0	8·2	2·7	3·1	3·2	1·6
Mydaus	16·6	16·4	8·1	4·2	6·1	6·0	1·6	1·5	1·55	0·6
Mephitis	14·0	17·1	5·5	4·3	6·1	6·0	1·4	1·8	1·0	0·7
Conepatus	17·0	20·8	6·8	5·5	8·0	7·4	1·7	1·9	1·4	0·9
Mellivora	31·9	32·8	11·8	9·7	13·2	10·8	3·0	3·1	2·9	1·3
Helictis	12·6	15·6	4·8	4·0	5·7	5·4	1·2	1·8	0·8	0·6
Ictonyx	10·7	12·8	4·0	3·2	4·4	4·4	1·2	1·7	1·0	0·8
Galictis	24·3	28·3	9·5	7·4	10·4	9·2	2·1	3·0	1·2	1·3
Grisonia	13·9	16·4	5·5	3·8	6·0	5·4	1·7	2·2	0·8	0·6
Mustela	16·0	20·4	6·0	4·7	6·5	6·9	2·0	2·8	0·4	0·5
Putorius	4·9	5·8	2·0	1·5	2·0	2·0	0·45	1·0	......	......
Gulo	37·0	43·0	13·0	11·6	14·5	13·6	4·7	5·7	1·8	1·5
Lutra	23·9	30·8	9·6	6·3	10·0	10·5	3·1	4·5	0·9	0·8
Aonyx	18·0	20·7	6·3	5·3	6·7	7·0	2·3	3·0	0·2	0·3
Enhydra	23·2	38·0	10·0	7·4	10·2	11·3	2·3	6·2	0·7	1·0
Ursus horribilis	81·5	92·0	32·5	27·0	40·0	27·0	7·5	7·7	6·0	4·0
Melursus	54·0	58·0	21·5	18·5	25·5	19·5	4·5	4·5	4·5	2·9

[Manus of *Ursus horribilis*... 22·0]
[Pes of *Ursus horribilis* ...... 25·0]
[Manus of *Melursus* .... 14·0]
[Pes of *Melursus* .... 13·0]

TABLE III.

	Basion to front of premaxilla.	Length of palate.	Greatest breadth of palate.	Palatine foramina in front or hinder half of palate.	Greatest width of zygomata.	Greatest breadth of brain-case.	Breadth of narrowest part behind post-orbital processes.	Length from front of lower canine to hinder surface of hindmost lower molar.
Canis	15·9	8·7	4·4	hinder	9·8	5·4	3·5	8·45
Procyon	10·3	8·8	2·4	hinder	7·4	4·7	2·5	5·0
Nasua	11·0	7·6	2·3	hinder	6·6	4·3	3·3	5·2
Cercoleptes	7·7	3·8	1·6	hinder	5·8	3·7	1·6	2·7
Ailurus	9·7	5·5	2·5	hinder	8·1	4·3	2·5	5·5
Ailuropus	23·5	12·4	4·0	hinder	21·0	8·0	3·5	14·2
Bassaris	7·1	3·4	1·4	hinder	5·0	3·4	1·8	3·4
Meles	12·2	7·0	2·0	near middle	8·6	5·0	2·2	5·2
Arctonyx	15·4	11·2	2·4	near middle	9·2	4·7	3·3	6·4
Taxidea	12·2	6·7	2·1	hinder	7·7	5·0	2·9	5·1
Mydaus	7·1	4·2	1·5	front ½	4·2	3·1	2·0	2·7
Mephitis	6·3	2·6	1·3	front ½	4·4	2·6	1·8	2·7
Conepatus	6·6	2·9	1·5	front ½	4·8	3·4	2·1	2·9
Mellivora	12·0	5·7	2·5	front or middle	8·0	5·6	2·6	4·6
Helictis	6·4	3·3	1·1	hinder or middle	4·2	3·0	1·8	2·7
Ictonyx	5·2	2·6	1·0	middle	3·7	2·8	1·4	2·3
Galictis	10·4	5·6	1·9	middle	6·8	4·4	2·1	4·0
Grisonia	7·1	3·8	1·7	front or middle	4·4	3·4	1·7	2·6
Mustela	4·3	1·8	0·8	hinder	2·5	1·9	1·1	1·55
Putorius	3·2	1·3	0·5	hinder	1·7	1·5	0·8	1·2
Gulo	13·2	7·4	3·0	hinder	9·6	5·7	4·0	6·0
Lutra	11·4	5·2	1·7	front ½	7·7	4·9	1·2	4·4
Aonyx	8·0	3·8	1·3	front	5·8	4·5	1·6	3·5
Enhydra	11·0	5·2	1·7	front	7·7	4·9	1·2	4·4
Ursus arctos	28·0	15·5	4·3	hinder	19·5	9·5	7·0	13·2
—— horribilis	30·0	17·0	4·8	hinder	20·5	9·8	7·2	14·4
—— americanus	21·6	11·9	3·5	hinder	13·6	7·7	5·9	10·0
—— thibetanus	28·0	15·0	4·0	hinder	19·0	10·5	7·3	12·0
—— malayanus	20·5	10·8	4·0	hinder	16·0	9·1	6·6	8·8
—— ornatus	15·5	8·0	3·0	hinder	10·2	7·4	4·6	7·8
—— maritimus	30·5	16·2	5·0	hinder	19·0	9·9	6·2	12·8
Melursus	24·5	13·7	5·1	hinder	16·2	8·5	6·1	10·3

TABLE IV.

	Antero-posterior extent of P. 4.	Antero-posterior extent of M. 1.	Transverse extent of M. 1.	Antero-posterior extent of M. 2.	Vertical extent of P. 4.	Vertical extent of M. 1.	Antero-posterior extent of M. 1.	Antero-posterior extent of M. 2.	Antero-posterior extent of M. 3.
Canis	″1·65	″1·1	″1·5	″·5	″1·2	″1·3	″2·0	″·8	″·4
Procyon	·8	·9	·9	·6	·65	·65	1·1	1·0	...
Nasua	·70	·75	·8	·65	·5	·5	·8	·8	...
Cercoleptes	·5	·48	·49	·4	·3	·2	·50	·49	...
Ailurus	·7	·85	1·1	·5	·55	·65	1·12	1·10	...
Ailuropus	2·6	2·7	2·7	3·7	...	...	3·2	2·5	2·0
Bassaris	·7	·6	·7	·3	·5	·5	·8	·55	...
Bassaricyon	·4	·55	·50	·3	...	...	·52	·50	...
Meles	1·5	...	...	...	·5	·5	1·7	·6	...
Arctonyx	1·6	...	...	...	·4	·4	1·8	·75	...
Taxidea	1·3	1·1	1·0	...	·7	·7	1·5	·5	...
Mydaus	·5	...	...	...	·4	·4	·8	·4	...
Mephitis	·60	·65	·65	...	·4	·4	·9	·3	...
Conepatus	·7	·83	·85	...	·6	·5	1·0	·4	...
Mellivora	1·3	·6	1·1	...	1·0	·8	1·3	...	...
Helictis	·7	·4	·6	...	·4	·25	·7	·20	...
Ictonyx	·7	·4	·6	...	·4	·35	·7	·25	...
Galictis	·7	·3	·7	...	...	...	·7	·25	...
Grisonia	·7	·3	·6	...	·4	·4	·8	·2	...
Mustela	·5	·15	·4	...	·3	·3	·45	·1	...
Putorius	·3	·13	·3	...	...	...	·3	·09	...
Gulo	2·0	·7	1·3	...	1·15	1·10	2·1	·5	...
Lutra	1·0	·8	1·0	...	·6	·6	1·3	·5	...
Aonyx	1·0	·7	1·0	...	·55	·50	1·2	·4	...
Enhydra	1·1	1·3	1·8	...	·7	·6	1·5	·6	...
Ursus arctos	1·3	2·0	1·5	3·3	1·0	·9	2·0	2·3	1·9
—— horribilis	1·6	2·0	1·5	3·7	·9	·8	2·2	2·4	1·9
—— americanus	1·1	1·7	1·3	2·5	·9	·8	1·7	1·7	1·2
—— thibetanus	1·1	1·9	1·4	3·0	·8	·9	2·0	2·0	1·6
—— malayanus	1·2	1·5	1·3	1·9	·8	·9	1·7	1·7	1·2
—— ornatus	1·1	1·5	1·2	2·1	·8	·9	1·7	1·7	1·2
—— maritimus	1·4	1·8	1·3	2·4	1·2	1·2	2·0	1·9	1·3
Melursus	1·1	1·7	1·0	1·7	?	?	1·6	1·4	·8

TABLE V.

Proportional parts of Skeleton, the spinal column from front of atlas to end of sacrum being taken as 100, length of:—

	Cervical region.	Dorsal region.	Lumbar region.	Sacrum.	Tail.	Pectoral limb.	Pelvic limb.	Humerus	Radius.	Femur.	Tibia.	3rd meta-carpal.	3rd meta-tarsal.	3rd phalanx of 3rd digit of manus.	3rd phalanx of 3rd digit of pes.
Canis	26·2	46·1	21·4	6·0	51·4	68·4	78·5	23·8	24·6	27·0	26·7	9·2	10·6	2·5	2·3
Procyon	16·9	41·9	28·7	12·3	78·0	74·5	91·7	27·4	28·7	32·3	33·9	7·6	10·6	2·7	2·7
Nasua	18·3	43·6	28·1	9·8	92·9	63·3	81·6	25·6	23·1	30·4	29·0	6·4	8·4	4·2	3·6
Cercoleptes	13·5	39·4	35·0	11·9	115·4	54·8	65·4	22·0	17·3	24·1	22·2	5·1	6·7	2·7	2·7
Ailurus	19·0	43·2	28·3	9·3	105·8	69·0	77·9	27·9	20·9	27·9	26·7	7·7	8·6	2·5	2·5
Ailuropus	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Bassaris	21·3	40·0	30·5	8·0	?	56·1	66·7	22·1	17·9	25·1	24·0	6·4	7·2	2·6	2·2
Bassaricyon	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Meles	17·7	52·6	22·0	7·5	39·1	53·2	62·2	19·7	17·7	23·4	19·7	5·7	6·7	3·6	2·4
Arctonyx	21·0	50·4	18·4	10·0	46·2	49·5	54·6	18·4	15·1	21·3	17·6	5·5	5·8	3·5	2·3
Taxidea	17·9	51·4	21·7	8·9	46·3	64·0	64·0	22·9	18·6	23·6	19·3	6·3	7·3	7·5	3·7
Mydaus	17·4	46·1	28·2	8·2	?	68·8	68·0	33·6	17·4	25·3	24·8	6·6	6·2	6·4	2·4
Mephitis	19·4	48·6	25·2	6·6	83·2	54·4	66·5	21·4	16·7	23·7	23·3	5·4	7·0	6·6	2·7
Conepatus	17·7	52·0	20·7	9·4	78·1	64·1	78·4	25·6	20·7	30·1	27·9	6·4	7·1	5·2	3·3
Mellivora	22·9	48·7	18·3	9·9	40·2	66·4	68·3	24·5	20·2	27·5	22·5	6·2	6·4	6·0	2·7
Helictis	19·3	45·2	27·9	7·4	73·2	51·8	64·1	19·7	16·4	23·4	22·2	4·9	7·4	3·2	2·4
Ictonyx	19·4	52·4	23·7	4·3	109·7	57·8	69·1	21·6	17·2	23·7	23·7	6·4	9·1	5·4	4·3
Galictis	21·4	42·2	25·9	8·6	80·8	56·7	66·1	22·1	17·2	24·2	21·4	4·9	7·0	2·8	3·0
Grisonia	20·7	51·8	21·3	6·0	53·3	42·3	50·0	16·7	11·5	18·2	16·4	5·1	6·7	2·4	1·8
Mustela	19·5	43·2	30·4	6·7	?	54·0	68·9	20·2	15·8	21·9	23·3	6·7	9·4	1·3	1·6
Putorius	21·9	40·6	30·8	6·5	35·7	34·0	47·1	16·2	12·1	16·2	16·2	3·6	8·1	......	......
Gulo	21·1	48·6	22·9	7·2	44·9	65·2	75·8	22·9	20·4	25·5	24·1	8·2	9·3	3·1	2·6
Lutra	20·6	46·4	26·6	6·2	81·8	39·5	50·9	15·8	10·4	16·5	17·3	5·1	7·4	1·4	1·3
Aonyx	17·2	45·2	27·6	9·8	86·3	53·5	61·6	18·7	15·7	19·9	20·8	6·8	8·9	0·5	0·8
Enhydra	13·7	48·0	27·4	10·8	54·1	37·4	61·2	16·1	11·9	16·4	18·2	3·7	10·0	1·1	1·6
Ursus horribilis	22·6	39·7	23·0	14·5	14·9	69·6	78·6	27·7	23·0	34·1	23·0	6·4	6·5	5·0	3·4
Melursus	21·2	45·0	20·6	13·1	26·0	67·5	72·5	16·8	23·1	31·8	24·3	5·6	5·6	5·6	3·6

Table VI.

Proportional parts of Skeleton, the spinal column from front of atlas to end of sacrum being taken as 100, length of:—

	Basion to pre-maxilla.	Length of palate.	Breadth of palate.	Breadth of zygomata.	Breadth of brain-case.	Breadth behind orbits.	Length from front of lower canine to hinder surface of hindmost lower molar.	Length of P. 4. (upper)	Length of M. 1. (upper)	Breadth of M. 1. (upper)	Length of M. 1. (lower)	Length of M. 2. (lower)
Canis	25·3	13·8	7·0	15·6	8·6	5·5	13·4	2·6	1·7	9·4	3·1	1·2
Procyon	28·2	24·1	6·5	20·2	12·8	6·8	13·9	2·1	2·4	2·4	3·0	2·7
Nasua	30·9	21·1	6·4	18·5	12·1	9·2	14·6	1·9	2·1	2·2	2·2	2·2
Cercoleptes	20·9	10·3	4·3	15·7	10·0	4·3	7·2	1·35	1·30	1·33	1·35	1·33
Ailurus	22·5	12·7	5·8	18·8	10·0	5·8	12·7	1·6	1·9	2·5	2·6	2·5
Bassaris	27·1	12·9	5·3	19·0	12·9	6·8	12·9	2·6	2·2	2·6	3·0	2·1
Meles	24·8	14·2	4·0	17·5	10·2	4·4	10·6	3·0	......	......	3·4	1·2
Arctonyx	25·8	18·8	4·0	15·4	7·9	5·5	10·7	2·6	......	......	3·0	1·2
Taxidea	28·8	15·8	4·9	18·2	11·8	6·8	12·0	3·0	2·6	2·3	3·5	1·1
Mydaus	29·4	17·4	6·2	17·4	12·8	8·2	11·2	2·0	......	......	3·3	1·6
Mephitis	24·5	10·1	5·0	17·1	10·1	7·0	10·5	2·3	2·5	2·5	3·5	1·3
Conepatus	24·9	10·9	5·6	18·1	13·2	7·9	10·9	2·6	3·1	3·2	3·7	1·5
Mellivora	23·3	11·9	5·2	16·6	11·6	5·4	9·5	2·7	1·2	2·2	2·7	......
Helictis	26·3	13·5	4·5	17·2	12·3	7·4	11·1	2·8	1·6	2·4	2·8	......
Ictonyx	28·1	14·0	5·4	20·0	15·1	7·6	12·9	3·7	2·1	3·2	3·7	1·3
Galictis	24·2	13·0	4·4	15·8	10·2	4·8	9·3	1·6	·7	1·6	1·6	·5
Grisonia	21·6	11·5	5·1	13·4	10·3	5·1	7·9	2·1	·9	2·1	2·4	·6
Mustela	14·5	6·0	2·7	8·4	6·4	3·7	5·2	1·6	·5	1·3	1·5	·3
Putorius	26·0	10·5	4·0	13·8	10·6	6·5	9·7	2·4	1·0	2·4	2·4	·7
Gulo	23·2	13·0	5·2	16·9	10·0	7·0	10·5	3·5	1·2	2·2	3·7	·8
Lutra	18·8	8·5	2·8	12·7	8·0	1·9	7·2	1·6	1·3	1·6	2·1	·8
Aonyx	23·8	11·3	3·8	17·2	13·3	4·7	10·4	2·9	2·0	2·9	3·5	1·1
Enhydra	17·7	8·3	2·7	12·4	7·9	1·9	7·0	1·7	2·0	2·9	2·4	·9
Ursus horribilis	25·6	14·5	4·1	17·5	8·3	6·1	12·3	1·3	1·7	1·2	1·8	2·0
Melursus	36·2	17·1	6·3	22·4	10·6	7·6	12·8	1·3	2·1	1·2	2·0	1·7

Table VII.

Proportions of Skull and Teeth, the length from basion to front of premaxilla being taken as 100.

	Length of palate.	Breadth of palate.	Breadth of zygomata.	Breadth of brain-case.	Breadth behind orbits.	Length of $\underline{\text{P. 4.}}$	Length of $\underline{\text{M. 1.}}$	Breath of $\underline{\text{M. 1.}}$	Length of $\underline{\text{M. 2.}}$	Length of $\overline{\text{M. 1.}}$	Length of $\overline{\text{M. 2.}}$	Length of $\overline{\text{M. 3.}}$
Canis	54·7	27·6	61·6	34·9	22·0	10·3	6·9	......	3·1	12·5	5·0	2·5
Procyon	85·4	23·3	71·8	45·6	24·2	7·7	8·7	8·7	5·8	10·6	9·7	......
Nasua	69·0	20·9	60·0	39·0	30·0	6·3	6·8	7·2	5·9	7·2	7·2	......
Cercoleptes	49·3	20·7	75·3	48·0	20·7	6·4	6·2	6·3	5·1	6·4	6·3	......
Ailurus	56·7	25·7	83·5	44·3	25·7	7·2	8·7	11·3	5·1	11·5	11·3	......
Ailuropus	52·7	17·0	89·3	34·0	14·8	11·0	11·4	11·4	15·7	13·1	10·6	8·5
Bassaris	47·9	19·8	70·4	47·9	25·3	9·9	8·4	9·9	4·2	11·2	7·7	......
Meles	57·5	16·3	70·4	40·9	18·0	12·2	......	......	......	13·9	4·9	......
Arctonyx	72·7	15·5	59·7	30·5	21·4	10·3	......	......	......	11·6	4·8	......
Taxidea	54·9	17·2	63·1	40·9	23·7	10·6	9·0	8·1	......	12·2	4·0	......
Mydaus	59·2	21·1	59·2	43·6	28·1	7·0	......	......	......	11·2	5·6	......
Mephitis	41·2	20·6	69·8	41·2	28·5	9·5	10·3	10·3	......	14·2	4·7	......
Conepatus	43·9	22·7	72·7	53·0	31·8	10·6	12·5	12·8	......	15·1	6·0	......
Mellivora	47·5	20·8	66·6	46·6	20·8	10·8	5·0	9·1	......	10·8	......	......
Helictis	51·5	17·1	65·6	46·8	28·1	10·9	6·2	9·3	......	10·9	3·0	......
Ictonyx	50·0	19·2	71·1	53·8	26·9	13·4	7·6	11·5	......	13·4	4·8	......
Galictis	53·8	18·2	65·3	43·2	21·9	6·5	2·9	6·5	......	6·5	2·4	......
Grisonia	53·5	23·9	62·0	47·9	23·9	9·9	4·2	8·4	......	11·2	2·8	......
Mustela	41·8	18·6	58·1	44·1	25·5	11·6	3·4	9·3	......	10·4	2·3	......
Putorius	40·6	15·6	53·1	46·8	25·0	9·3	4·0	9·3	......	9·3	2·8	......
Gulo	56·0	22·7	72·7	43·2	30·3	15·1	5·3	9·8	......	15·9	3·7	......
Lutra	45·6	14·9	67·9	42·9	10·5	8·7	7·0	8·7	......	11·4	4·4	......
Aonyx	47·5	16·2	72·5	56·2	20·0	12·5	8·7	12·5	......	15·0	5·0	......
Enhydra	47·2	15·4	70·0	44·5	10·9	10·0	11·8	16·3	......	13·6	5·4	......
Ursus arctos	55·3	15·3	69·6	33·9	25·0	4·6	7·1	5·3	......	7·1	8·2	6·7
—— horribilis	56·6	16·0	68·3	32·6	24·0	5·3	6·6	5·0	......	7·3	8·0	6·3
—— americanus	55·0	16·2	62·9	35·6	27·3	5·0	7·8	6·0	......	7·8	7·8	5·5
—— thibetanus	53·5	14·2	67·8	37·5	26·0	3·9	6·7	5·0	......	7·1	7·1	5·7
—— malayanus	52·6	19·5	78·0	44·3	32·1	5·8	7·3	6·3	......	8·2	8·2	5·8
—— ornatus	51·6	19·3	65·8	47·7	29·6	7·0	9·6	7·7	......	10·9	10·9	7·7
—— maritimus	53·1	16·3	62·2	32·4	20·3	4·5	5·9	4·2	......	6·5	6·2	4·2
Melursus	55·9	20·8	66·1	34·6	24·8	4·4	6·9	4·0	......	6·5	5·7	3·2

Proportion borne by the pelvic limb (femur, tibia, and pes) to the pectoral limb taken as 100.

Canis dingo	114·6	Mellivora	102·8
Procyon	123·1	Helictis	123·7
Nasua	128·8	Ictonyx	119·6
Cercoleptes	119·3	Galictis	116·4
Ailurus	112·7	Grisonia	117·9
Bassaris	119·0	Mustela	127·5
Bassaricyon	—	Putorius	118·3
Meles	116·8	Gulo	116·2
Arctonyx	110·1	Lutra	128·8
Taxidea	100·0	Aonyx	115·0
Mydaus	100·0	Enhydra	163·7
Mephitis	122·1	Ursus horribilis	112·8
Conepatus	122·3	Melursus	107·4

4. Report on the Collection of Birds made during the Voyage of the Yacht 'Marchesa.' Part II. Borneo and the Island of Cagayan Sulu. By F. H. H. Guillemard, M.A., M.D., F.L.S., &c.

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(Plate XXV.)

Section I. BORNEO.

The cruise of the 'Marchesa' in Borneo was confined to the Sarawak district and the territory of the North Borneo Company. Certain islands to the northward were also visited, the most interesting of which was Cagayan Sulu, a solitary volcanic island in the Sulu Sea, from which no specimens have hitherto been brought. Examples of altogether one hundred and fourteen species were obtained from the mainland of Borneo. All these have, with one exception, been previously recorded from that country, and as the chief interest in the collection lies in the fact of some of the localities being new, a list only of the species is here given.

Spilornis pallidus, Walden.

Spilornis bacha, Salvadori, Uccelli di Borneo, p. 7.

Silam, Darvel Bay, N.E. Borneo.

Microhierax latifrons, Sharpe.

Silam, Darvel Bay.

Loriculus galgulus, Linn.

Loriculus galgulus, Salvad. *op. cit.* p. 26.

Three specimens from Silam.

J. Smit lith. Hanhart imp.

MIXORNIS CAGAYANENSIS.

CHOTOREA CHRYSOPSIS, Goffin.

Chotorea chrysopsis, Salvad. *op. cit.* p. 32.

Two specimens, ♂ and ♀, from Silam.

CHOTOREA VERSICOLOR, Raffles.

Chotorea versicolor, Salvad. *op. cit.* p. 33.

♂, from Sarawak. Iris brown; bill and feet greenish-brown.

CHOTOREA MYSTACOPHANES, Temm.

Chotorea mystacophanus, Salvad. *op. cit.* p. 34.

♂, and *juv.* ♂, from Sarawak.
♂, from Usukan Bay, N. Borneo.
4 ♂ adult, from Silam.
♀. Silam.
♂ *juv.* Silam.

XANTHOLÆMA DUVAUCELII, Lesson.

Xantholæma duvaucelii, Salvad. *op. cit.* p. 38.

♂, from Silam.

CALORHAMPHUS FULIGINOSUS, Temm.

Calorhamphus fuliginosus, Salvad. *op. cit.* p. 39.

Two specimens from Silam, Darvel Bay. In both the chin and throat are red, and there is only a slight yellowish margin on the lowest feathers of the throat. The beak in both instances is pinkish white, but unfortunately the sex is not indicated.

IYNGIPICUS AURITUS, Eyton.

Iyngipicus fusco-albidus, Salvad. *op. cit.* p. 42.

♂ and ♀. Kimanis River, N. Borneo.

XYLOLEPES VALIDUS, Reinw.

Xylolepes validus, Salvad. *op. cit.* p. 43.

Two specimens, from Sandakan and Silam, N. Borneo.

CALLOLOPHUS PUNICEUS, Horsf.

Callolophus puniceus, Salvad. *op. cit.* p. 49.

♂. Silam.

CALLOLOPHUS MENTALIS, Temm.

Callolophus mentalis, Salvad. *op. cit.* p. 49.

♂. Silam.
♂ *juv.* Sandakan.

TIGA JAVANENSIS, Ljungh.

Tiga javanensis, Salvad. *op. cit.* p. 54.

One specimen from Sarawak.

MEIGLYPTES TRISTIS, Horsf.

Meiglyptes tristis, Salvad. *op. cit.* p. 56.

♂ and ♀. Silam.
♂ and ♀. Sandakan.

Meiglyptes tukki, Lesson.
Meiglyptes tukki, Salvad. *op. cit.* p. 57.
♂. Kudat, W. Borneo.
2 ♂. Sandakan.
♀. Sandakan.
The iris of the Kudat bird is noted as dark brown.

Sasia abnormis, Temm.
Sasia abnormis, Salvad. *op. cit.* p. 60.
♀. Silam.

Coccystes coromandus, Linn.
Coccystes coromandus, Salvad. *op. cit.* p. 67.
Silam.

Eudynamis malayana, Cab. & Hein.
Eudynamis malayana, Salvad. *op. cit.* p. 68.
♂. Sandakan.

Rhinortha chlorophæa, Raffles.
Rhynortha chlorophæa, Salvad. *op. cit.* p. 69.
Silam, two specimens.
Sandakan, one specimen.
♂. Sarawak.
In the Sandakan and Silam specimens the sex is not given. In the male from Sarawak the head is fulvous and the tail black.

Rhopodytes sumatranus, Raffles.
Rhopodytes sumatranus, Salvad. *op. cit.* p. 73.
Silam. Crissum greyish black.

Rhamphococcyx erythrognathus, Hartl.
Rhamphococcyx erythrognathus, Salvad. *op. cit.* p. 74.
Two specimens from Sandakan.
Two specimens from Silam.
All have the median rectrices tipped with chestnut. In two of the skins, one from each locality, the chin is ash-coloured.

Centrococcyx eurycercus, Hay.
Centrococcyx eurycercus, Salvad. *op. cit.* p. 78.
♂. Sandakan.

Hydrocissa albirostris, Shaw.
Hydrocissa albirostris, Salvad. *op. cit.* p. 82.
Silam, one specimen. The four external rectrices are entirely white.

Merops bicolor, Bodd.
Merops bicolor, Salvad. *op. cit.* p. 90.
♂. Kimanis River, N. Borneo.
♂. Abai, N. Borneo.
Silam, one specimen.
Iris dark brown.

NYCTIORNIS AMICTA, Temm.

Nyctiornis amicta, Salvad. *op. cit.* p. 91.

Two specimens from Silam.

♂. Sandakan.

ALCEDO BENGALENSIS, Gm.

Alcedo bengalensis, Salvad. *op. cit.* p. 92.

♂. Sigaliud River, Sandakan.

Silam, one specimen.

PELARGOPSIS LEUCOCEPHALA, Gm.

Pelargopsis leucocephala, Salvad. *op. cit.* p. 95.

♂. Sigaliud River, Sandakan.

Pale ochraceous; the upper surface bright bluish-green. No regular cap, but slightly marked with brown on the head. Bill from gape 8·8 centims., wing 14·1 centims. Iris ruddy brown; bill coral, dark at tip; tarsus brilliant coral-red.

CEYX DILLWYNI, Sharpe.

Ceyx dillwyni, Salvad. *op. cit.* p. 99.

Ceyx sharpei, id. ibid. p. 98.

Silam, one specimen.

HALCYON COROMANDA, Lath.

Callialcyon coromanda, Salvad. *op. cit.* p. 101.

♂. Silam.

Juv. Silam.

The young bird has the entire upper surface chestnut, faintly washed with violet. Beneath, the feathers of the breast and abdomen are delicately tipped with black.

HALCYON CONCRETA, Temm.

Caridagrus concretus, Salvad. *op. cit.* p. 102.

Juv. Silam.

CALYPTOMENA VIRIDIS, Raffl.

Calyptomena viridis, Salvad. *op. cit.* p. 106.

2 ♂. Silam.

♂. Sandakan.

EURYLÆMUS JAVANICUS, Horsf.

Eurylæmus javanicus, Salvad. *op. cit.* p. 107.

♂. Silam.

2 ♀. Silam.

EURYLÆMUS OCHROMELAS, Raffl.

Eurylæmus ochromelas, Salvad. *op. cit.* p. 108.

♂. Silam.

♂ *juv.* Silam.

♀. Silam.

CYMBORHYNCHUS MACRORHYNCHUS, Gm.

Cymborhynchus macrorhynchus, Salvad. *op. cit.* p. 109.

♂. Sarawak.
2 ♀. Sarawak.
Sandakan, one specimen.
Silam, one specimen.

Appears very much more common on the Sarawak river than in any part of the N. Borneo district I have visited. Four out of the five individuals have more or less white on the inner webs of the outer rectrices.

CORYDON SUMATRANUS, Raffl.

Corydon sumatranus, Salvad. *op. cit.* p. 111.

♂. Sarawak River. Iris purple.

BATRACHOSTOMUS AURITUS, Vig.

Batrachostomus auritus, Tweed. P. Z. S. 1877, p. 439.

Silam, one specimen.

CAPRIMULGUS MACRURUS, Horsf.

Caprimulgus macrurus, Salvad. *op. cit.* p. 117.

♂. Kimanis River, N. Borneo.

COLLOCALIA LINCHII, Horsf. & Moore.

Collocalia linchii, Salvad. *op. cit.* p. 121.

Sandakan, one specimen.

MACROPTERYX COMATUS, Temm.

Dendrochelidon comata, Salvad. *op. cit.* p. 123.

♂. Sandakan.
♂. Sigaliud River, Sandakan.
♀. Sigaliud River.
Shot 13th April.

STOPORALA THALASSINOIDES, Cab.

Stoporala thalassinoides, Salvad. *op. cit.* p. 132.

Silam, one specimen.

HYPOTHYMIS OCCIPITALIS, Vig.

Hypothymis azurea, Salvad. *op. cit.* p. 133.

♂. Sigaliud River, Sandakan.

RHIPIDURA JAVANICA, Sparrm.

Leucocerca javanica, Salvad. *op. cit.* p. 135.

♀. Sigaliud River, Sandakan.

TERPSIPHONE AFFINIS, Hay.

Terpsiphone affinis, Salvad. *op. cit.* p. 137.

2 ♂. Silam.

♂. Sarawak.
Juv. Silam.

The three males are in full plumage. The young bird has the uropygium and tail-feathers bright chestnut. The two median rectrices are prolonged about an inch beyond the others, and still show the sheath at their base.

PHILENTOMA VELATUM, Temm.

Philentoma velatum, Salvad. *op. cit.* p. 139.

♂. Silam.

ARTAMUS LEUCORHYNCHUS, Linn.

Artamus leucorhynchus, Salvad. *op. cit.* p. 140.

Silam, one specimen.

PERICROCOTUS IGNEUS, Blyth.

Pericrocotus igneus, Salvad. *op. cit.* p. 144.

♂. Sarawak.
♂. Silam.

LALAGE TERAT, Bodd.

Lalage terat, Salvad. *op. cit.* p. 145.

♂. Abai, N. Borneo.
Juv. Sandakan.

LALAGE CULMINATA, Hay.

Volvocivora schierbrandii, Salvad. *op. cit.* p. 148.

♀. Silam.

IRENA CRINIGER, Sharpe.

Irena cyanea, Salvad. *op. cit.* p. 151.

2 ♂. Silam.
♂. Sandakan.
♀. Sigaliud River, Sandakan.

The Chinese use the feathers of this bird in Canton to make a sort of blue enamel in articles of jewellery.

CHAPTIA MALAYENSIS, Hay.

Chaptia malayensis, Salvad. *op. cit.* p. 153.

Sigaliud River, one specimen.

DISSEMURUS BRACHYPHORUS, Temm.

Dissemurus brachyphorus, Salvad. *op. cit.* p. 154.

♂. Banguey I., N. Borneo.
♀. Banguey I.
♀. Sarawak.
Silam, two specimens.

MYIOLESTES OBSCURUS, Horsf.

Myiolestes obscurus, Salvad. *op. cit.* p. 156.

♂. Usukan Bay, N. Borneo.
♂. Benoni River, N. Borneo.
♀. Usukan Bay.

PACHYCEPHALA GRISEOLA, Blyth.

Hyloterpe griseola, Salvad. *op. cit.* p. 157.

♂. Libarran I., N. Borneo.

SITTA FRONTALIS, Horsf.

Dendrophila frontalis, Salvad. *op. cit.* p. 161.

♂. Silam.
♀. Silam.

DICÆUM TRIGONOSTIGMA, Scop.

Dicæum trigonostigma, Salvad. *op. cit.* p. 166.

♂. Sigaliud River, Sandakan.
♂. Kudat.
♂. Silam.

? ÆTHOPYGA SIPARAJA, Raffl.

Æthopyga eupogon, Salvad. *op. cit.* p. 173.

♂. *juv.* Banguey I., N. Borneo.

This bird has the colouring of the female, except that the chin and throat are washed with red. Wing 5 centims., culmen 1·5 centims., tarsus 1·2 centims. Iris reddish; bill brown, except the basal half of lower mandible, which is yellow; *feet and tarsus coral-red*! Salvadori gives the colour of the feet as fuscous: in the Cat. Birds, vol. ix. it is stated to be dark brown. I should place little reliance on the label had it not been written by myself; it is borne out by the colour of the legs in the dried skin being a faded pinkish yellow. It is possible that the present example may be the immature bird of a new species. Banguey is separated from the N. point of Borneo by a shallow channel some eight miles in width.

CINNYRIS HASSELTI, Temm.

Nectarophila hasseltii, Salvad. *op. cit.* p. 177.

♂. Sigaliud River, Sandakan.

CHALCOSTETHA INSIGNIS, Jard.

Chalcostetha insignis, Salvad. *op. cit.* p. 177.

♂. Sarawak.
3 ♀. Libarran I., N. Borneo.

This species was very abundant on Libarran, an island lying two or three miles off the coast in Lubuk Bay; but during a two months' visit to the north of Borneo, I do not recollect ever having seen it elsewhere.

ANTHOTHREPTES MALACCENSIS, Scop.

Anthreptes malaccensis, Salvad. *op. cit.* p. 178.

3 ♂. Libarran I., N. Borneo.
♂. *juv.* Libarran I.
♀. Libarran.
♂. Usukan Bay, N. Borneo.
♀. Usukan Bay.

ANTHOTHREPTES HYPOGRAMMICA, S. Müll.

Hypogramma nuchalis, Salvad. *op. cit.* p. 172.

♂. "Borneo," exact locality unknown.

ANTHOTHREPTES PHŒNICOTIS, Temm.

Chalcoparia singalensis, Salvad. *op. cit.* p. 180.

♂. Bidi, Sarawak.
3 ♂. Silam.
Iris a dull dark pink.

ARACHNOTHERA CHRYSOGENYS, Temm.

Arachnothera chrysogenys, Salvad. *op. cit.* p. 181.

Silam, one specimen.

ARACHNOTHERA FLAVIVENTRIS.

Arachnothera eytonii, Salvad. *op. cit.* p. 182.

♂. Sigaliud River, Sandakan.
♀. Sigaliud River.
♀. Silam.

There appears to be an immense difference in size between the sexes. Thus the measurements of the three present examples are as follows:—

	Wing.	Bill from gape.	Tail.	Tarsus.
♂	11·2	4·5	6·5	2·2
♀	9·3	4·1	5·7	2·1
♀	9·4	3·8	5·3	2·1

The male is more yellowish on the upper surface, and somewhat brighter beneath. The female (No. 2) has the wing-coverts and wings irregularly spotted with dull yellowish-white. These birds frequented the high trees in small flocks, searching the flowers for insects.

ARACHNOTHERA MODESTA, Eyton.

Arachnothera modesta, Salvad. *op. cit.* p. 183.

♂ (?). Sigaliud River, Sandakan.

This individual is of unusual size. Wing 9·0 centims., bill from forehead 3·9 centims.; tarsus 1·8 centims.

ARACHNOTHERA ROBUSTA, Müll. and Schleg.

Arachnothera robusta, Salvad. *op. cit.* p. 184.

2 ♀. Silam.

ARACHNOTHERA LONGIROSTRIS, Lath.
Arachnothera longirostra, Salvad. *op. cit.* p. 186.
♂. Silam.

ARACHNOTHERA CRASSIROSTRIS, Reichenb.
Arachnothera crassirostris, Salvad. *op. cit.* p. 187.
♀. Silam.

ÆGITHINA VIRIDIS, Bp.
Iora scapularis, Salvad. *op. cit.* p. 190.
♂. Cape Sapanmangio, N. Borneo.
Wings and tail black; no sign of black on the head.

CHLOROPSIS ZOSTEROPS, Vig.
Chloropsis sonneratii, Salvad. *op. cit.* p. 193.
♀. Silam.

CHLOROPSIS CYANOPOGON, Temm.
Phyllornis cyanopogon, Salvad. *op. cit.* p. 194.
2 ♂. Silam.
♂. Sarawak.
♂. Sandakan.

PYCNONOTUS PLUMOSUS, Blyth.
Pycnonotus plumosus, Salvad. *op. cit.* p. 198.
♂. Kudat, N. Borneo.

PYCNONOTUS SIMPLEX, Less.
Sandakan, one specimen.

RUBIGULA WEBBERI, Hume.
Ixidia squamata, Salvad. *op. cit.* p. 200.
Silam, one specimen.

MICROPUS MELANOCEPHALUS, Gm.
Brachypodius melanocephalus, Salvad. *op. cit.* p. 201.
♂. Silam.
The tail-feathers, and more especially the outer pair, are much more broadly tipped with yellow than is the case in the Malaccan birds with which I have been able to compare it.

HEMIXUS MALACCENSIS, Blyth.
Hypsipetes malaccensis, Salvad. *op. cit.* p. 202.
Silam, two specimens.
One of these is irregularly marked with buffish brown on the wing, chiefly on the greater wing-coverts and secondaries, but otherwise shows no signs of immaturity.

CRINIGER GUTTURALIS, Müll.
Criniger gutturalis, Salvad. *op. cit.* p. 206.
Silam, one specimen.
This example is much larger than the measurements given in

the Cat. of Birds. Culmen 2·4 centims., wing 11·5 centims., tail 10·1 centims., tarsus 2·2 centims.

CRINIGER PHÆOCEPHALUS, Hartl.

Criniger phæocephalus, Salvad. *op. cit.* p. 207.

Silam, two specimens.

POMATORHINUS BORNEENSIS, Cab.

Pomatorhinus borneensis, Salvad. *op. cit.* p. 210.

Silam, two specimens.

STACHYRIS MACULATA, Temm.

Timelia maculata, Salvad. *op. cit.* p. 211.

♂. Silam.

STACHYRIS NIGRICOLLIS, Temm.

Timelia nigricollis, Salvad. *op. cit.* p. 212.

Silam, two specimens.

MIXORNIS BICOLOR, Blyth.

Cyanoderma erythropterum, Salvad. *op. cit.* p. 213.

♂. Sandakan.

♂. N. Borneo.

Iris crimson-lake; bill bluish-black; skin of side of head and neck bright cobalt-blue.

MIXORNIS CAGAYANENSIS, Guillemard.

♀. Abai, N. Borneo?

This individual agrees with those obtained on the island of Cagayan Sulu (*vide infrà,* p. 419). The present example is without any tinge of chestnut on the upper surface. The striping appears almost entirely confined to the throat. Wing 6·1 centims., tail 6·0 centims.; bill from gape 1·8 centims., tarsus 1·9 centims.

It is just possible that this bird may have been wrongly labelled, and that its correct locality is the island of Cagayân Sulu.

DRYMOCATAPHUS CAPISTRATOIDES, Temm.

Drymocataphus capistratoides, Salvad. *op. cit.* p. 218.

Silam, one specimen.

KENOPIA STRIATA, Blyth.

Kenopia striata, Salvad. *op. cit.* p. 223.

Silam, one specimen.

ERYTHROCICHLA BICOLOR, Less,

Malacopteron ferruginosum, Salvad. *op. cit.* p. 228.

Silam, one specimen.

PITTA MUELLERI, Bp.

Pitta mülleri, Salvad. *op. cit.* p. 240.

♂. Silam.

♀. Silam.

2 *juv.* Silam.

Both the young birds have the throat white, and the forehead washed with chestnut. The white on the shoulder appears to become cobalt by gradual assumption of that colour in the feather, and not by moult.

Pitta baudii, Müll. & Schleg.

Pitta baudii, Salvad. *op. cit.* p. 243.

Three ad. (♂ ?). Silam.

Juv. (♂ ?). Silam.

♀ (?). Silam.

In none of these is there any note of the sex. The three adult birds are alike, except that in one the black nuchal collar is edged posteriorly with shining dark blue, thus forming a second collar of that colour. In the young bird the chin and upper throat are whiter, and the rest of the under surface rufescent, darker on the breast, and with some dark-blue feathers in the median line and on the flanks. Above, the head and nape are light brown, and the uropygium dark grey. The feathers of the back and scapulars are umber-brown, with the base dark grey. A few red feathers of the new moult are seen appearing irregularly here and there, especially in the scapular region.

The fifth example differs greatly from the others. On the upper surface the head is rufous, merging gradually on the back into the same shade of red as is seen in the adult male. Beneath, the throat is whitish, and the rest of the under surface a uniform buffish tint, the feathers black at the base. Bill brown; lores and sides of face fawn-colour.

The above individual has no appearance of immaturity, and I believe it to be the female. No allusion to any sexual differences of plumage is, however, made by Schlegel (Mus. Pays-Bas), Salvadori (Ucc. di Born.), or Elliot (Monog. Pittidæ).

Pitta schwaneri, Temm.

Pitta schwaneri, Salvad. *op. cit.* p. 243.

Two (♂ ?). Silam.

♀ (*vel juv.*). Silam.

The last example differs from the others in having the under surface buff, not yellow, but barred with bluish-black as in the adult male. The blue abdomen is replaced by greyish feathers tinged with rufous, which have lavender reflections in certain lights. Sinciput and vertex brown, with three or four longitudinal black stripes; supraocular stripe fawn-coloured in its anterior, yellow in its posterior half; subocular and auricular feathers black, tipped with fawn; occiput black. The bird is apparently mature.

Gerygone flaveola, Cab.

Sandakan, one specimen.

This example corresponds in every way with those obtained at Meimbun during the visit of the 'Marchesa' to Sulu Island. It is slightly paler than Celebes skins; the lores are brownish white, and the external rectrices have no white on the outer web as in *G. sulphurea.*

ORTHOTOMUS CINERACEUS, Blyth.

Orthotomus cineraceus, Salvad. *op. cit.* p. 248.

♂. Sigaliud River, Sandakan.
2 ♂. Usukan Bay, N. Borneo.

CITTOCINCLA STRICKLANDI, Mottl. & Dillwyn.

Kittacincla stricklandii, Salvad. *op. cit.* p. 253.

♂. Kudat, N. Borneo.
♀. Banguey I., N. Borneo.
Silam, four specimens.

Iris light brown. Length 23·0 centims. The example from Banguey is smaller, and has the lower part of the back immediately above the white rump washed with orange-chestnut.

COPSYCHUS AMŒNUS, Horsf.

Copsychus amœnus, Salvad. *op. cit.* p. 255.

♂. Sigaliud River, Sandakan.

TURDUS PALLENS, Pall.

Turdus pallens, Salvad. *op. cit.* p. 256.

♀. Silam.

HENICURUS LESCHENAULTII, Vieill.

Henicurus frontalis, Salvad. *op. cit.* p. 258.

Three ad. sk. Silam.
Juv. Silam.

I can detect no constant differences in plumage between these individuals and the examples of *H. leschenaulti* in the British Museum. The much larger size of the Javan bird is, however, very noticeable. The following are the measurements in centimetres of the present examples and those given in the Cat. B.

	Wing.	Culmen.	Tarsus.
H. leschenaulti (Java)	10·9	2·4	3·0
„ (Borneo)	9·3	2·0	2·7

ANTHUS GUSTAVI, Swinh.

Silam, one specimen.

ORIOLUS XANTHONOTUS, Horsf.

Oriolus xanthonotus, Salvad. *op. cit.* p. 277.

2 ♂. Silam.
♂ *juv.* Silam.
♂. Sigaliud River, Sandakan.
2 ♀. Silam.

The young male much resembles the females, but has the head somewhat darker, while the wing-coverts have no chestnut edgings. The median rectrices are black tipped with yellow, not olive-yellow; while, beneath, the chin and throat are dusky.

Platysmurus aterrimus, Temm.

Platysmurus aterrimus, Salvad. *op. cit.* p. 279.

♂. Sigaliud River, Sandakan.

Silam, one specimen.

Platylophus coronatus.

Platylophus coronatus, Salvad. *op. cit.* p. 280.

2 ♂ ? Silam.

Juv. Silam.

♂. Sigaliud River, Sandakan.

Osmotreron vernans, Linn.

Treron vernans, Salvad. *op. cit.* p. 286.

♂. Kimanis River, N. Borneo.

The Punai appears to be extremely abundant at the western part of the North-Borneo Company's possessions.

Osmotreron olax, Temm.

Treron olax, Salvad. *op. cit.* p. 289.

2 ♂. Silam.

Myristicivora bicolor, Scop.

Carpophaga bicolor, Salvad. *op. cit.* p. 292.

Silam, three specimens.

These examples are all without black markings on the thighs and under tail-coverts, except a slight tipping of the latter in one case. Each has 14 rectrices, and the external pair are broadly tipped with black.

Chalcophaps indica, Linn.

Chalcophaps indica, Salvad. *op. cit.* p. 299.

♂. Kudat, N. Borneo.

♂. Banguey I., N. Borneo.

Argusianus grayi, Elliot.

Argusianus grayi, Salvad. *op. cit.* p. 305.

♂. Silam.

♂. Sandakan.

Euplocomus nobilis, Sclat.

Euplocomus nobilis, Salvad. *op. cit.* p. 306.

♂. Silam.

2 ♂. Sandakan.

Rollulus rouloul, Scop.

Rollulus rouloul, Salvad. *op. cit.* p. 308.

3 ♂. Silam.

Excalfactoria chinensis, Linn.

Excalfactoria chinensis, Salvad. *op. cit.* p. 311.

♀. Silam.

ÆGIALITES PERONI, Temm.
Ægialites peronii, Salvad. *op. cit.* p. 315.
♂. Usukan Bay, N. Borneo, June 4th.

STREPSILAS INTERPRES, Linn.
Strepsilas interpres, Salvad. *op. cit.* p. 320.
♂. Libarran I., N. Borneo, April 16th.

TRINGA ALBESCENS, Temm.
Actodromas albescens, Salvad. *op. cit.* p. 323.
Sandakan Bay, one specimen.

TRINGOIDES HYPOLEUCUS, Linn.
Tringoides hypoleucus, Salvad. *op. cit.* p. 326.
Sandakan Bay, one specimen.

TOTANUS INCANUS, Gm.
Totanus incanus, Salvad. *op. cit.* p. 329.
♀. Usukan Bay, N. Borneo, June 3rd.

NUMENIUS UROPYGIALIS, Gould.
Numenius phæopus, Salvad. *op. cit.* p. 333.
Silam, one specimen.

GALLINAGO STENURA, Kuhl.
Gallinago stenura, Salvad. *op. cit.* p. 334.
Silam.

SULA PISCATOR, Linn.
Sula piscator, Salvad. *op. cit.* p. 368.
Silam, one specimen.

Section II. CAGAYAN SULU.

The island of Cagayan Sulu, lying, as it does, in an isolated position in the Sulu Sea, is extremely interesting to the ornithologist. Placed midway between Palawan and the islands of the Sulu Archipelago, with which latter it should on no account be confounded, it lies somewhat nearer to the coast of Borneo, from which, however, it is distant over fifty miles. It is of purely volcanic origin, and Admiral Keppel, so long ago as 1853, made us acquainted with its curious crater-lakes. It is not, however, with its geological aspects that we have to deal, but with its avifauna, which, I believe, has, up to the present, remained completely unexplored.

In April 1883 I visited the island in Mr. Kettlewell's yacht 'Marchesa,' remaining for about a week, and nearly ten months later we again touched there on our return voyage to Singapore. Although I collected diligently on both visits, the results were singularly meagre, and I do not recollect ever meeting with a locality so poor in bird-life. This, however, is probably owing to the island being, geologically speaking, of comparatively recent formation. The few species that were obtained are interesting as showing a mixed Philippine and Bornean ornis, with a decided preponderance of the latter.

The entire collection obtained upon the island numbers but fifteen species. Setting aside seven of these as being of wide distribution, we have eight species remaining. Of these, two only are Philippine—*Tanygnathus luzoniensis*, and a *Calornis*, which, though not specifically separable from *C. panayensis*, is of markedly larger dimensions. Two—*Chibia pectoralis* and *Carpophaga pickeringi*—occur, so far as we know, neither in Borneo nor the Philippines, but are found in the Sulu Islands; three of the remaining four are purely Bornean; and the last is a new species of *Mixornis*, probably peculiar to the island. It is interesting therefore to note that, while to the westward Cagayan Sulu is connected by shallow soundings with the great coral-reefs at the north of Borneo, to the east it is separated from the Sulu Archipelago by a comparatively deep sea.

1. Tanygnathus luzoniensis, Linnæus.

a, b. ♂.

Iris yellow; bill scarlet; tarsus olive-green. The blue of the head is much brighter than in examples from Sulu Island, and is more extensive, occupying the vertex instead of being confined to the occipital region. A specimen from Lapac Island in the Sulu Archipelago is intermediate in this respect between the Sulu and Cagayan Sulu birds. The present examples have the under surface more strongly washed with golden yellow. The natives keep this species in captivity.

2. Sauropatis chloris, Boddaert.

a, b. ♂.

Iris brown; bill leaden black, base of lower mandible whitish; feet brown. Abundant on the sea-shore and at the crater-lakes.

3. Eudynamis malayana, Cabanis.

a, b. ♂.

c. ♀.

Iris in male crimson; bill pea-green; feet and tarsus olive-green. Length of male 41·0 centims. Agrees with Bornean skins.

4. Centrococcyx eurycercus, Hay.

a. ♂.

Iris brown; bill black; tarsus lead-coloured. This species has been recorded from Palawan by Mr. Everett.

5. Lalage terat, Boddaert.

a. ♂.

Iris yellow; bill and feet black. Not distinguishable from Bornean or Philippine examples, but peculiar in having a yellow iris.

6. Chibia pectoralis, Wallace.

a–c. ♂.

d. ♀.

Iris ruddy brown in *a*, brown in the female *d*; in the others I have made no note of the colour. Bill and tarsus black. A close comparison with skins from Sulu Island which, from the presence of the silky frontal tuft and other characteristics, must be referred to *C. pectoralis*, does not show any apparent specific differences, though it must be allowed that the present examples have no trace of frontal plumes. On the other hand, several of the Sulu birds are equally devoid of it.

7. Hirundo javanica, Sparrm.

a. ♀ (April 3rd).

Flying about in numbers in the vicinity of the crater-lakes in the month of April.

8. Mixornis cagayanensis, sp. nov. (Plate XXV.)

M. bornensi *similis*; *sed fronte, superciliis et regione parotica cinereis, et dorso cinerascenti-olivaceo, haud castaneo, facile distinguendus.*

a. ♂.

b. Sex. incert.

Iris pale yellow; bill and feet lead-coloured; length about 14·5 centims.; wing 6·4 centims.; tail 6·0 centims.; bill from gape 1·8 centim.; tarsus 2·0 centims.

Above greyish olive; the forehead greyish, with black shafts to the feathers, the occipital region with a tinge of chestnut; feathers round the eye and in the parotic region ashy; throat and chin pure white, broadly striped with black; breast pale yellow, also broadly striped, shading off below into the yellowish olive-grey of the crissum and under tail-coverts; thighs with a slight reddish tint; under wing-coverts white; wings chestnut; tail brown, with traces of dark barring.

This species, which was common in low bushes in the more open situations in the island, is at once distinguishable from *M. bornensis* by the upper surface being of an ashy olive-brown instead of chestnut. It has a loud note of alarm, is very restless in its movements, and apparently rarely flies far off the ground.

9. Orthotomus cineraceus, Blyth.

a. ♂.

Iris brown; bill and legs flesh-coloured. Is identical with *O. borneoensis* of Salvadori, which Mr. Sharpe (Cat. B. vol. vii. p. 226) considers to be the adult male of the present species.

10. Anthothreptes malaccensis, Scopoli.

a, b. ♂.

c. Juv. ♂.

Iris brown, with no ruddy tinge. The under surface is intermediate between the bright yellow and *chlorogaster* varieties. Size somewhat large, the wing measuring 6·9–7·0 centims.; tail about 5·5 centims.

11. Calornis panayensis, Scopoli.

a–d. ♂.

e, f. ♀.

Iris brilliant red-orange; bill and tarsus black. Length 22·0–

23·0 centims. These examples are not separable from Sulu skins excepting as regards size. The following measurements (in centims.) seem to show that the greater dimensions of the former are tolerably constant:—

		Wing.	Tarsus.
Cagayan Sulu,	♂	11·6	2·3
" "	♂	11·2	2·3
" "	♀	10·5	2·2
" "	♀	11·3	2·2
" "	♀	11·3	2·2
Sulu Island,	♂	10·2	2·1
" "	♂	10·6	2·2
" "	♂	10·2	2·0
" "	♂	10·3	2·0
" "	♀	10·3	2·1
" "	♀	10·4	2·1

12. Carpophaga pickeringi, Cassin.

a–e. ♂.
f. ♀.
Iris dull red; bill bluish-green; feet and tarsus dull red. Length 42·0–44·5 centims.; wing 22·8–25·1 centims.; tail 16·0–17·5 centims.; culmen 2·0–2·1 centims.; tarsus about 3·0 centims. Sexes alike.

These examples correspond with an individual of this species obtained in Sulu Island during the visit of the 'Marchesa' to that Archipelago. There is but little individual variation in the series; but in some the iridescent colour of the tail inclines rather to blue than green. This Pigeon was apparently abundant in the neighbourhood of the crater-lakes.

13. Strepsilas interpres, Linnæus.

a. ♀.
Iris brown; bill bluish-black; feet bright orange-red.

14. Tringoides hypoleucus, Linnæus.

a. ♀.
Iris brown; bill brownish black; feet very dark olive. It is singular to observe how the habits of birds are adapted to circumstances. Both this and the preceding species perch on the mangroves, not on the trunks only, but in the branches. A small island near Tanjong Tavo-tavo, if indeed the word island can be applied to a collection of mangrove trees springing from the water, was the invariable resort of a large quantity of whimbrel, whose favourite perch seemed always to be upon the highest boughs.

15. Demiegretta sacra, Gmelin.

a. ♂.
Iris chrome-yellow; tarsus olive, with black patches on the anterior aspect; feet with under surface bright yellow.

LIST OF THE PUBLICATIONS

OF THE

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[August 1, 1885.]

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AND AT THE SOCIETY'S GARDENS IN THE REGENT'S PARK.

May 5, 1885.

Prof. W. H. Flower, LL.D., V.P.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of April 1885:—

The total number of registered additions to the Society's Menagerie during the month of April was 132, of which 33 were by presentation, 66 by purchase, 12 by birth, one by exchange, and 20 were received on deposit. The total number of departures during the same period, by death and removals, was 117.

The most noticeable additions during the month of April were as follows:—

1. A pair of Rhinoceroses, apparently referable to the Sumatran species, *Rhinoceros sumatrensis*. These are young animals, perhaps about three quarters of their full size, and form an interesting acquisition as being the first pair of any species of this genus that have been together in the Society's Menagerie.

They were purchased of Mr. Cross of Liverpool on the 16th of April for the sum of £500.

2. A female Tibetan Wild Ass or Kiang (*Equus hemionus*), deposited by Mr. W. Jamrach on the 7th of April. This is the only example of this species of Wild Ass that we have had in the Gardens since the specimen presented by the late Major W. E. Hay in 1859[1].

3. Two Gouldian Grass-Finches (*Poëphila gouldiæ*), one adult and one in young plumage, but both supposed to be of the male sex, presented by Mr. C. N. Rosenfeld on April 18th, and new to the Society's collection. It is possible that the controversy respecting the coloration of the sexes of this species[2] may be settled upon the death of these specimens.

The following papers were read:—

1. Quelques remarques sur le Dimorphisme Sexuel. Par Jean Stolzmann[3].

[Received March 3, 1885.]

La théorie du transformisme a occupé, dans ces derniers temps, une place des plus importantes dans la science, formant, pour ainsi dire, la base des sciences biologiques. Il y a cependant une école de naturalistes qui s'opposent encore à l'accepter, probablement sous l'influence des anciennes traditions. Néanmoins toute la nouvelle génération des savants a accepté la théorie de Darwin avec un enthousiasme extraordinaire, la prenant pour point de départ pour toutes les questions de la philosophie naturelle. La majorité des

[1] See P. Z. S. 1859, p. 305, pl. lxxiii.
[2] See Gould's 'Birds of Australia,' vol. iii. plates 88 and 89.
[3] Communicated by M. L. Taczanowski, C.M.Z.S.

savants de tous les pays civilisés admire la simplicité de sa théorie, et la conformité de ses lois avec les faits fournis par des observations scientifiques. Les ennemis de l'hypothèse de la sélection naturelle cherchent vainement des faits et des arguments qui lui soient contraires ou défavorables. Au lieu de la combattre, on a fourni une quantité de faits qui la confirment.

Il y a cependant un point faible dans la théorie de Darwin, qui a excité depuis son apparition une vive polémique au sein des Darwinistes mêmes. Je veux parler de l'hypothèse de la sélection sexuelle. L'émule même de Darwin, Mr. Alfred Russell Wallace, se montrait contraire à l'influence active des femelles sur le choix de mâles, et plusieurs autres Darwinistes ont réfuté cette hypothèse, sans donner cependant une explication satisfaisante du dimorphisme sexuel. De cette manière l'idée de la sélection sexuelle pouvait persister dans la science jusqu'à nos jours.

Darwin, qui est si clair, si ferme dans ses arguments quand il parle de la sélection naturelle, a formulé sa théorie de la sélection sexuelle sur des bases très peu solides. D'un côté il a pris les observations, faites par plusieurs personnes sous l'influence d'un parti pris ; d'un autre côté il s'est basé sur les lois d'hérédité, qui, selon sa propre expression, sont très capricieuses, très instables et surtout presque impénétrables pour nous. Il est donc très facile de comprendre, que les partisans mêmes du savant anglais ont reçu l'idée de la sélection sexuelle avec une certaine réserve et plusieurs l'ont complètement rejetée.

Je me permets de présenter ici aux lecteurs quelques remarques sur la sélection sexuelle, en tâchant en même temps d'expliquer le fait du dimorphisme sexuel au moyen d'un autre agent, conforme à plusieurs faits de la biologie et de l'embryologie des animaux. Je dois cependant prévenir le lecteur, que je prendrai tous mes exemples dans la classe des oiseaux que j'ai eu l'occasion d'étudier pendant les neuf années de mes voyages dans les Cordillères du Pérou et de l'Equateur. Si mes remarques trouvent un bon accueil, d'autres spécialistes, plus compétents que moi, pourront les appliquer aux diverses classes du règne animal.

L'étude des oiseaux nous montre qu'une grande partie d'espèces est dimorphe, c'est à dire, que les mâles diffèrent des femelles soit par la coloration, soit par divers appendices, soit par la taille, les mâles étant les plus souvent plus forts que les femelles ; enfin le dimorphisme sexuel se manifeste quelquefois par la faculté des mâles de produire une sorte de musique vocale ou instrumentale, dont les femelles ne sont pas dotées. Darwin explique les différences sexuelles au moyen du choix exercé par les femelles, celles-ci donnant toujours la préférence aux mâles les plus beaux et les plus attrayants. Il attribue de cette manière aux femelles un goût esthétique de la même nature que celui de l'homme. Pour expliquer une vive coloration chez les femelles des plusieurs espèces, Darwin la base sur les lois d'hérédité, et suppose que les couleurs voyantes ont été acquises premièrement par les mâles sous l'influence de la sélection sexuelle, et que ce n'est qu'après qu'elles ont été transmises aux femelles, totalement ou à un degré plus ou moins considérable.

Darwin cherche dans les mêmes lois d'hérédité la cause de la coloration des jeunes oiseaux, qui, dit-il, ressemblent ou bien aux deux parents, ou bien exclusivement à la femelle (dans les espèces dimorphes), ou, enfin, diffèrent par leur coloration de tous les deux. Darwin réunit toute la série des différences entre les adultes et les jeunes dans six cathégories, en les expliquant par la loi d'apparition des caractères aux âges correspondants. Si donc les caractères mâles ont été acquis dans le jeune âge, ils se montrent aussi de bonne heure chez les jeunes, dans lesquels cas le plus souvent ces caractères avaient été transmis aux femelles complètement ou peu s'en faut. C'est pour cette raison que chez les espèces dont les mâles et les femelles sont colorés vivement, comme, par exemple, chez les toucans et chez les perroquets, les jeunes possèdent déjà dans leur premier plumage la vive coloration des parents.

Au premier abord, il nous est difficile d'admettre chez les femelles des oiseaux la présence d'un goût esthétique si fortement développé comme le signale Darwin. D'un autre côté, il y a une série de transitions entre les oiseaux richement colorés et ceux aux couleurs sombres, qu'il nous sera impossible de démarquer la limite où finit l'action de la sélection naturelle et où commence l'influence d'autres causes (de la sélection sexuelle, par exemple). La couleur jaune, par exemple, appartient sans nul doute aux couleurs vives. Or, je connais des espèces du genre américain *Basileuterus* (*B. castaneiceps* et *B. coronatus*), qui possèdent la distribution topographique[1] très capricieuse, prouvant que les deux espèces citées ne sont pas isolées l'une de l'autre, mais qu'au contraire elles peuvent communiquer entre elles. La première possède une coloration sombre et le ventre blanc grisâtre ; la deuxième ressemble en tout à la première à l'exception du ventre, qui est d'un jaune citron, cette couleur étant propre aux mâles et aux femelles. Nous avons dit déjà que la couleur jaune appartient à la cathégorie des couleurs vives ; il faut donc accepter, avec Darwin, qu'elle s'est développée premièrement chez les mâles sans l'influence de la sélection sexuelle et qu'après elle était transmise aux femelles en vertu des lois d'hérédité. Nous serons donc forcés d'admettre, que les femelles du *B. coronatus* ont dévancé de beaucoup celles de l'autre espèce dans le développement du goût sans cause apparente, parceque, comme je l'ai déjà dit, les deux espèces peuvent communiquer entre elles. Nous pourrions donc nous attendre à ce que les femelles de l'espèce sombre, en voyant les mâles au ventre jaune, les choisissent, et que cette race se propageât très vite ; tandis, qu'en

[1] Il faut distinguer entre la distribution orographique et la distribution topographique. La première embrasse les cas de la dispersion dans le plan vertical ; la deuxième—les cas où nous comparons les formes habitants les deux versants d'une haute chaîne des montagnes ou les deux côtés d'une vallée profonde, située entre deux chaînes des montagnes hautes (comme p. e. la vallée du Haut Marañon).

réalité les deux races occupent des contrées souvent très rapprochées sans se mêler pourtant.

Cette instabilité dans le développement du prétendu goût chez les femelles des oiseaux se manifeste encore dans les exemples suivants, choisis parmi plusieurs autres : les deux espèces d'oiseaux-mouches, très proches, appartenant au genre *Schistes* (*S. geoffroyi* et *S. personatus*), se trouvent la première sur le versant oriental et la deuxième sur le versant occidental des Cordillères. La première espèce ne dépasse pas la hauteur de 5000′ au dessus du niveau de la mer ; la deuxième, celle de 3000′ ; elles sont donc complètement isolées l'une de l'autre par la chaîne des Andes, vu que cette chaîne a au moins 8000′ de hauteur. En outre, la première possède une distribution géographique très vaste : elle habite la Colombie ; moi je l'ai trouvé sur le versant oriental des Andes Equatoriennes, et M. Jelski l'a rencontré au Pérou central (12° lat. sud), ce qui représente au moins 20° géographiques dans la direction du méridien. L'espèce occidentale se trouve exclusivement sur le territoire Equatorien entre 2° lat. nord et 2° lat. sud. Les deux formes ressemblent beaucoup l'une à l'autre et la principale différence entre elles est une plaque frontale, composée de plumes squamiformes brillantes, qui orne seulement l'espèce occidentale. Cette parure étant propre exclusivement aux mâles du *S. personatus*, nous devrions admettre, avec Darwin, qu'elle est développée sous l'influence de la sélection sexuelle, si tel est le cas. Comment se fait-il alors, que le goût des femelles de l'espèce à plaque diffère tellement de celui du *S. geoffroyi*, quand chez ce dernier il reste le même sur une étendue de 20° géographiques ? Les partisans de la sélection sexuelle répondront à cela probablement, qu'il faut chercher la cause de cette différence dans l'isolement des deux espèces, cet isolement étant complet, comme je le crois moi-même. Mais en examinant le cercle de la distribution du *S. geoffroyi*, qui embrasse, comme je l'avais dit plus haut, presque 20° géographiques, nous trouverons, que ce cercle est divisé presque en moitié par la profonde vallée du Marañon, située à peine 1200′ au dessus du niveau de la mer. Cette vallée joue le même rôle que les hautes chaînes des montagnes, c'est à dire, qu'elle divise deux faunes, différentes jusqu'à un certain degré, formant pour plusieurs espèces un obstacle infranchissable, entre autres pour le *S. geoffroyi*, qui ne descend pas plus bas de 4000′ d'altitude. Nous voyons donc, que les individus de cette espèce habitant les contrées situées au nord de Marañon, sont isolés de ceux qui se trouvent au sud de ce fleuve, et cependant les uns comme les autres ne possèdent pas de parure frontale. Par quel hasard alors dans le premier cas l'isolement a-t-il donné pour résultat la différence dans le goût des femelles, et dans le deuxième, malgré un isolement tout aussi complet, ce goût est-il resté le même sur une étendue de plusieurs degrés géographiques ? Les deux cas précédents nous prouvent, que l'isolement n'est pas une condition nécessaire pour différencier le prétendu goût des femelles chez les oiseaux. Nous verrons aussi dans les cas suivants se confirmer notre assertion.

Les oiseaux-mouches du genre *Oreotrochilus* habitent les hauteurs de l'Equateur, du Pérou et de la Bolivie, se tenant à une altitude de 14,000′ plus ou moins. La chaîne des Cordillères atteint ou dépasse cette hauteur dans plusieurs endroits isolés ; on peut donc considérer les lieux habités par le *Oretrochilus* comme autant d'îles séparées les unes des autres par des distances plus ou moins grandes. Nous trouvons dans les Cordillères de l'Equateur deux espèces, appartenant au genre *Oreotrochilus*, savoir *O. pichinchæ* et *O. chimborazo*. Les mâles des deux espèces possèdent toute la tête d'un superbe bleu-violet, et l'unique différence importante entre elles est une bande verte sur la gorge bleue du *O. chimborazo*. Les deux espèces sont très connues des chasseurs Equatoriens, qui les poursuivent pour les collections et les vendent à Quito ou à Riobamba, en le nommant "el quinde[1] de Pichincha" et "el quinde de Chimborazo." La différence entre les mâles des deux espèces en question doit être attribuée, selon Darwin, à la sélection sexuelle, les femelles ne possédant aucune parure sur la tête.

Selon l'opinion de mon chasseur, qui faisait des collections sur toute l'étendue de la république de l'Equateur, depuis Tulcan (frontière Colombienne), jusqu'à Loja (frontière Péruvienne), le *O. pichinchæ* habite les volcans Pichincha, Tunguragua, El Altar, Carahuayrazo et Asuay, tandis que l'autre espèce ne se trouve que sur le mont Chimborazo. Et cependant la distance entre Carahuayrazo et Chimborazo est peut-être six fois plus petite que celle qui sépare la Pichincha de Tunguragua ou celle entre El Altar et Asuay. Nous rencontrons donc ici encore le même fait inexplicable, que le goût des femelles est resté le même malgré une distance de 30 lieues à peu près, qui sépare les montagnes Pichincha et Tunguragua, tandis qu'il a pris des différentes directions sur les monts Chimborazo et Carahuayrazo, qui sont séparés par une distance insignifiante, ne dépassant peut-être pas 5 lieues en direction rectiligne.

La *Calliste yeni* est, sans aucun doute, un des oiseaux les plus richement colorés. La tête est d'un vert clair, le dos noir veloutiné, le croupion écarlate, la gorge et les épaulettes violettes et les dessous du corps bleu de ciel—tous ces couleurs très vives et très belles. La femelle ressemble en tout au mâle, ce qui ferait présumer à Darwin, que cette riche coloration s'est développée au premier abord chez les mâles sous l'influence de la sélection sexuelle et après a été transmise aux femelles. L'oiseau en question possède une distribution géographique très vaste, étant connu au Brésil, au Pérou, en Bolivie et à l'Equateur. Au Pérou il habite les plaines du haut Amazone et atteint dans les Cordillères une hauteur de 3000′. Dans la république de l'Equateur je l'ai trouvé dans la vallée du Pastaza à une hauteur de 5000′. Presque partout il est commun et bien connu des habitants. Et cependant malgré une dispersion si génerale, dans la vallée du fleuve Huambo (un des confluents de Huallaga) j'ai trouvé à une hauteur de 3700′ une autre espèce (*Calliste cœlicolor*), différant de la *C. yeni* uniquement par le croupion, qui est dans sa partie inférieure d'un splendide jaune doré. *Calliste cœlicolor* ne se trouve point ni dans l'Equateur, ni dans le

[1] *Quinde*, nom indien, signifie "oiseau-mouche."

Pérou centrale et la Bolivie. La dispersion de deux espèces prouve clairement qu'elles ne sont pas isolées l'une de l'autre, les cercles de leur distribution n'étant pas séparés par une haute chaîne des montagnes. Pourquoi donc le goût chez les femelles de deux espèces s'est-il développé si diffèrement, si chez la race *Calliste yeni* il persiste sans changement sur une étendue si vaste? Nous avons vu, que cette dernière espèce atteint dans l'Equateur oriental une altitude de 5000′, tandis qu'au Pérou septentrional déjà à une hauteur de 3700′ (Huambo) elle est remplacée par une autre espèce.

Quoique les exemples cités nous montrent une inconstance extraordinaire dans le développement des couleurs chez les espèces voisines dans les Cordillères, inconstance qui ne peut être expliquée par le principe de la sélection sexuelle, ces exemples ne peuvent cependant pas servir d'arguments incontestables pour combattre ce principe. Je suis loin de leur donner une telle importance. Mais ces exemples peuvent servir de fondement pour la considération suivante : l'inconstance de la coloration des oiseaux se montre non seulement chez les espèces aux couleurs voyantes, mais aussi chez les formes modestement colorées, et comme exemple je peux citer les deux espèces du genre *Leptasthenura* (*L. andicola* et *L. pileata*), dont la première habite le versant oriental et la deuxième le versant occidental des Cordillères du Pérou. Ces deux formes possèdent une coloration très modeste, et cependant il y a des différences remarquables dans la distribution des stries sur la tête et le dos. Or, étant admis que les mêmes effets ont été produits par les mêmes causes, nous serons forcés d'admettre une des deux suppositions suivantes : toutes les couleurs chez les oiseaux se développent sous l'influence de la sélection sexuelle, et alors nous nous trouvons en présence de maintes difficultés, comme par exemple dans le cas de couleurs sympathiques ; ou bien, si ce n'est pas le cas, nous devons chercher d'autres causes pour expliquer le dimorphisme sexuel, et alors nous sommes obligés de rejeter complètement la théorie de la sélection sexuelle. J'ai tout lieu d'admettre cette dernière supposition.

D'abord la théorie de la sélection sexuelle est incapable de nous expliquer pourquoi les poils des mammifères sont privés de couleurs voyantes. Les mammifères occupent un degré plus élevé dans l'échelle des animaux que les oiseaux ; ils devraient donc avoir le goût plus développé que ces derniers. Nous connaissons la préférence qu'ont les sauvages pour les couleurs vives : le tatouage en est une preuve saillante. Pourquoi donc la sélection sexuelle n'a-t-elle pas développé sur leurs corps quelques ornements colorés?

Comparons les collections des oiseaux des Indes, des îles Moluques ou de l'Amérique méridionale avec celles des oiseaux européens, et nous serons frappés par la pauvreté de la coloration de ces derniers, et, ce qui est encore plus intéressant, nous y trouverons à peine quelques-uns aux couleurs métalliques, qui sont de toutes les couleurs les plus splendides. Est-ce que tous les oiseaux d'Europe possèdent le goût moins développé que les oiseaux des tropiques?

La théorie de la sélection sexuelle est incapable de nous donner une explication du fait que les oiseaux nocturnes sont sans exception colorés modestement, et pourtant Darwin admet la sélection sexuelle pour plusieurs engoulevents. La même observation concerne les oiseaux qui se tiennent dans les fourrés épais, et qui forment, pour ainsi dire, une transition entre les formes diurnes et nocturnes.

Enfin, comment expliquer l'absence des couleurs vives dans des groupes entiers des oiseaux, comme par exemple chez les Dendrocolaptidés et les Formicariidés, qui comptent plusieurs centaines d'espèces? Dans la famille Formicariidæ le dimorphisme sexuel est très développé, parceque, sous peu d'exception, dans toutes les espèces les mâles diffèrent des femelles et cependant dans aucune d'entre elles nous ne trouvons un seul exemple de la coloration voyante.

Il y a donc des motifs sérieux pour abandonner la théorie de la sélection sexuelle. Guidé probablement par des considérations semblables, Mr. Wallace s'est déclaré contraire à cette théorie en voulant expliquer les différences sexuelles par la seule action de la sélection naturelle. Mr. Wallace prétend, que les couleurs chez les oiseaux se développent indépendamment de toute action directe des oiseaux mêmes, et que dans les espèces dont les mâles sont beaux et les femelles possèdent une coloration sombre, il faut attribuer cette dernière à l'action de la sélection naturelle, agissant dans le but de la sécurité des femelles. Cette idée est juste jusqu'à un certain point; elle est générale, pour être appliquée dans tous les cas. Mr. Wallace constate le fait sans chercher les causes qui provoquent, pour ainsi dire, l'action de la sélection sexuelle. L'examen de ces causes nous démontrera que la sélection naturelle a produit, selon toute probabilité, non seulement les couleurs sombres des femelles, mais aussi les couleurs voyantes des mâles, leurs appendices extraordinaires, leurs armes offensives etc. etc.

On ne peut pas douter, que les couleurs se développent souvent chez les oiseaux indépendamment de toute action de la sélection naturelle, et alors comme les causes directes de la coloration il faut regarder à priori les agents physico-chimiques, comme la lumière et la nourriture. Plusieurs faits nous conduisent à admettre l'action directe de ces agents sur la coloration des oiseaux—le fait, par exemple, que le *Ibis rubra* pris jeune et élevé en captivité ne prend jamais la riche coloration de cette espèce. Malheureusement nos connaissances dans ces cas sont trop insuffisantes pour pouvoir établir quelques lois: nous devons attendre de la Zoologie expérimentale, qui n'existe pas encore, quelques jets de lumière sur ce point obscur. Aujourd'hui nous pouvons seulement nous limiter à l'examen de causes indirectes, qui influencent la coloration chez les oiseaux, en nous expliquant le fait si fréquent du dimorphisme sexuel. Ici nous nous trouverons sur le même terrain d'argumentation combinée avec les faits positifs comme toute la théorie de la sélection naturelle; et nous aurons recours aux mêmes lois qui servaient à Darwin à l'établissement de son ingénieuse théorie.

"Il existe généralement plus de mâles que de femelles; aussi des veufs ou des jeunes célibataires, s'adressent-ils souvent, pour se faire une compagne, à des femelles déjà accouplées"[1]. Toutes les

[1] A. E. Brehm. 'La vie des Animaux,' trad. franç. de L. Gerbe: Paris, vol. iii. p. xxi.

collections ornithologiques (naturellement si le sexe y a été constaté par les voyageurs mêmes) confirment cette assertion du savant ornithologiste. Ainsi M. de Castelnau, dans son mémoire présenté à l'Académie le 6 Mars 1848, ne mentionne que 287 femelles sur 3750 oiseaux recueillis pendant son voyage dans l'Amérique du Sud, c'est à dire $\frac{1}{13}$ de la collection entière. Les collections faites par moi au Pérou et dans l'Equateur présentent aussi la supériorité numérique de mâles, quoique celle-ci n'est pas si frappante comme chez Castelnau. Ainsi par exemple sur le chiffre général de 290 oiseaux-mouches, recueillis par moi au Pérou, il y en avait 203 mâles sur 87 femelles, c'est à dire la proportion de 3 : 1. Il est à remarquer, que la supériorité numérique de mâles est généralement plus considérable chez les espèces dimorphes que chez espèces monomorphes. Il paraît qu'il faut chercher la cause de cette disproportion sexuelle dans l'inégalité des rôles des deux sexes, la femelle possédant le rôle plus difficile que le mâle. C'est elle qui dans la majorité des espèces est forcée de bâtir son nid justement à l'époque qui doit décider les naissances de mâles ou de femelles selon la nutrition plus ou moins complète des ovaires. Réellement MM. Morel de Vinde, Hofacker et Giron de Ruzareinger ont démontré, que l'œuf mieux nourri se développe en femelle et dans le cas contraire en mâle. Il n'y a donc rien d'étonnant qu'il nait en général plus de mâles que de femelles, puisque celles-ci, occupées de leurs besognes maternelles, sont forcées de consacrer beaucoup de temps à la construction du nid, ce qui ne leur permet pas assez de se nourrir.

L'observation directe des mâles étant difficile, nous ne pouvons que supposer que les spermatozoïdes provenant des glandes sexuelles mieux nourries engendrent plus de mâles, et dans le cas contraire plus de femelles. Il est à ajouter, que les mâles dans la grande majorité des espèces sont plus forts que les femelles, ce qui nous prouve que les premiers sont en général mieux nourris que les dernières, fait facile à expliquer par la difficulté du rôle des femelles. Ainsi donc toutes nos observations et les dates statistiques concernant le rôle des deux sexes, leur développement corporel et leur proportion numérique sont d'accord : le rôle plus difficile des femelles est la cause de leur nutrition plus faible, ce qui à son tour entraîne la supériorité numérique de naissances mâles.

D'autre part il nous sera facile de décider la question, lequel des deux sexes est plus important pour la conservation de l'espèce ? Un mâle suffit généralement pour plusieurs femelles et son rôle est limité dans la majorité de cas aux simples actes de la fécondation ; tandis que la femelle s'occupant d'élevage de la progéniture est sans doute bien plus importante pour la conservation de l'espèce. La prépondérance numérique des femelles serait donc plus utile pour ceci. Le contraire ayant lieu dans la nature grâce aux difficultés surgissant pour la femelle pendant l'époque de l'incubation, la sélection naturelle doit veiller pour le rétablissement d'équilibre sexuel en neutralisant la prépondérance de l'élément mâle.

Si nous parvenons à démontrer, que cette prépondérance de l'élément mâle est nuisible pour l'espèce, il nous sera facile à comprendre l'action de la sélection naturelle, qui a pour but non le bien du sexe, mais celui de l'espèce.

Les mâles célibataires sont tout-à-fait inutiles pour l'espèce, ne prenant aucune part à sa propagation; au contraire, ils lui sont nuisibles en occupant inutilement les places limités dans l'économie de la nature, ce qui rend évidemment plus difficile la nutrition nécessaire du sexe femelle pendant l'époque de réproduction ; il faut donc considérer les mâles célibataires comme parasites de l'espèce. Prenons un exemple : supposons qu'une région donnée peut nourrir 175 individus d'une certaine espèce. En admettant dans ce chiffre la proportion numérique de mâles et de femelles de 1 : 3, c'est à dire 75 femelles sur 100 mâles; en supposant même que l'espèce est monogame, nous aurions un excès de 25 mâles, qui sans contribuer au bien de l'espèce consomme $\frac{1}{7}$ de sa nourriture, c'est à dire, que s'ils n'existaient pas, chaque femelle aurait $\frac{1}{7}$ de nourriture de plus pour son compte. Cette proportion croitra encore pour les espèces polygames. Admettant, par exemple, que toutes les 5 femelles n'ont besoin que d'un seul mâle, nous obtiendrons dans le cas donné pour 75 femelles seulement 15 mâles necéssaires, c'est à dire que 85 individus mâles inutiles consomment la moitié de la nourriture destinée au chiffre général de 175 individus pouvant exister sur l'espace donné.

Les mâles célibataires rendent l'existence de l'espèce plus difficile non seulement en occupant inutilement les places limitées dans l'économie de la nature, mais ils lui nuisent encore directement, poursuivant les femelles pendant l'époque d'incubation, détruisant les œufs, etc. etc. Un tel mâle, ne faisant cas de l'élevage de jeunes oiseaux, tâche seulement de satisfaire ses besoins sexuels justement au moment où les occupations de la femelle exigent une tranquillité complète. Il arrive probablement aussi que les célibataires parviennent quelquefois à leur but, ce qui doit nuire à la fécondité de femelles.

Toutes les causes ci-dessus mentionnées nous conduisent à considérer la prépondérance numérique de mâles comme nuisible à la conservation de l'espèce et les mâles célibataires comme des parasites. La sélection naturelle veillant toujours pour le bien de l'espèce et pour sa conservation, c'est le même agent qui doit veiller pour le rétablissement d'équilibre sexuel constamment altéré. Il nous paraît superflu d'avoir recours à un agent aussi artificiel que la sélection sexuelle, en pouvant expliquer les divers faits du dimorphisme sexuel par la sélection naturelle même.

Prenons un exemple. Supposons que quelque circonstance force une certaine espèce de Gallinacés de nicher à terre. Ceci entraîne nécessairement le besoin d'une grande fécondité des femelles, pour compenser les nombreuses pertes causées par des quadrupèdes détruisant les œufs. A mesure de l'augmentation du nombre des œufs chez le même oiseau, chacun d'eux n'est plus suffisamment nourri, la quantité de la nourriture restant la même, ce qui entraîne, nous l'avons déjà dit, la prépondérance numérique de naissances mâles. Nous venons de démontrer, que la prépondérance numérique des mâles est nuisible pour l'espèce, donc la sélection naturelle, pour rétablir l'équilibre sexuel altéré, donne la préférence à la progéniture de ceux parmi les mâles qui seront en état de chasser et de tenir à distance tous les célibataires. De cette manière ont dû apparaître toutes les armes offensives des mâles, comme les éperons sur les pattes ou sur les ailes. C'est ici qu'il faut chercher aussi la cause de la polygamie, principalement développée chez les espèces dimorphes ; parceque, si à cause de la grande fécondité de Gallinacés par exemple, il s'agit d'une meilleure nutrition des ovaires, les mâles, qui s'empareront de plusieurs femelles, en chassant leurs rivaux et en diminuant ainsi le nombre des individus sur l'espace donné, laisseront une progéniture plus nombreuse et plus forte, et qui plus est, en facilitant aux femelles la recherche de la nourriture, assureront l'augmentation de naissances femelles. La position des femelles sera encore plus favorisée, si pendant les combats des mâles une part de mâles parasites périt. La nécessité des combats est donc évidente et leur utilité se trouve en relation directe avec leur efficacité, c'est à dire, qu'elle est d'autant plus grande qu'un plus grand nombre d'individus mâles y succombe. En considérant les combats amoureux comme ayant pour cause la sélection naturelle veillant pour la conservation de l'espèce, il nous sera facile d'expliquer la présence de la crête chez le coq.

La crête joue un rôle important dans les combats. Il est facile à comprendre, que le coq, qui parvient à attraper son ennemi par la crête, peut donner plus aisément le coup mortel d'éperon ; c'ést pourquoi on coupe toujours la crête aux coqs de combat. En tout cas cet appendice est très incommode pour les combattants, puisqu'il est évident, que les autres chances étant égales, celui d'eux, qui possède la crête plus grande, doit succomber ; nous pourrions donc supposer avec raison, que cet organe devrait disparaître si ce sont les mâles à crête plus petite qui gagnent les combats. Considérant pourtant la chose de notre point de vue, nous la verrons autrement. N'oublions pas avant tout, que l'efficacité des combats de mâles décide la proportion numérique des naissances mâles et femelles ; qu'elle est ainsi une des questions les plus importantes pour l'espèce.

Nous venons de voir, que la crête facilite les combats, les faisant plus efficaces ; nous avons vu aussi, que les combats sont utiles à l'espèce—ergo, la crête est utile à l'espèce.

S'il faut considérer l'éperon comme hérédité du père, la crête a dû être transmise par la poule. La sélection naturelle favorisait celles parmi les poules qui pouvaient transmettre à leur progéniture une crête plus grande. La crête s'est donc probablement développée d'abord chez les femelles, afin de pouvoir être transmise à leur progéniture mâle. Notre supposition est appuyée par le fait de la présence de la crête chez la poule, tandis que les autres caractères mâles, comme par exemple la coloration splendide, les longues tectrices caudales et les éperons, lui manquent.

En considérant la prépondérance numérique de mâles comme nuisible à l'espèce, nous parvenons à expliquer dans beaucoup de cas l'apparition de caractères sexuels secondaires. Les belles couleurs des mâles ont probablement pour but, dans beaucoup de cas au moins, de les faire plus visibles pour les femelles, qui, ayant une coloration sombre, peuvent échapper aisément aux persécutions de mâles, surtout de célibataires nuisibles. On peut supposer aussi, que dans plusieurs cas les couleurs des mâles se sont développées afin d'attirer sur eux les yeux des oiseaux de proie, pour que ceux-ci, en détruisant une part d'eux, rétablissent ainsi inconsciemment l'équilibre sexuel.

Nous comprendrons aussi facilement la présence de longues plumes chez les mâles de nombreuses espèces, comme p. e. chez les oiseaux de paradis, chez les veuves (*Vidua*) et chez l'engoulevent africain (*Cosmetornis*). Telles plumes ont probablement pour but de relantir le vol des mâles. J'ai constaté chez la *Loddigesia mirabilis* (oiseau-mouche péruvien), que le vieux mâle possède l'aile de quelques milimètres plus courte que le jeune mâle ou la femelle. Cet avortement des rémiges provient assurément à cause de développement extraordinaire de rectrices externes chez le vieux mâle de cet oiseau-mouche. Si donc d'une part les rectrices allongées rendent le vol plus difficile et d'autre les ailes plus petites diminuent sa vélocité, le vol du mâle doit être plus lent que celui de la femelle, le poids du corps restant le même. Le développement extraordiniare soit des rémiges soit des rectrices, en relantissant le vôl des mâles, rend leur rôle plus difficile, en facilitant en même temps celui des femelles. Nous pouvons prendre comme exemple le *Cosmetornis*, qui, comme tous les engoulevents, se nourrit d'insectes, qu'il attrape au vol. Chez cet oiseau quelques plumes des ailes se développent extraordinairement pendant l'époque de réproduction, en retardant visiblement son vôl. Il est donc facile à remarquer, qu'alors le mâle, ayant les mouvements plus lourds, n'est pas en état de se procurer la même quantité d'insectes qu'auparavant ; ainsi donc la femelle a plus de chances de trouver une nourriture plus abondante.

Toutes les réunions des mâles, leurs danses bizarres, leur chant, enfin, ne servent pas probablement à séduire les femelles, mais pour distraire les mâles, ce qui rend plus faciles les besognes maternelles des femelles et au surplus les protège contre l'assiduité nuisible des célibataires. Darwin lui-même constate le fait, qu'ordinairement pendant les réunions des mâles, quand ces derniers sont trop occupés par le combat ou la danse, la femelle s'échappe avec un d'eux pour copuler. Ainsi donc dans ce cas c'est bien la sélection naturelle et non la sélection sexuelle, qui agit pour la conservation d'équilibre sexuel.

Quelquefois la sélection naturelle a doté les femelles d'armes pour leur donner la possibilité de combattre les mâles célibataires. C'est donc une autre forme des efforts de la sélection naturelle dans son travail pour le rétablissement d'équilibre sexuel. Nous pouvons donc nous expliquer la présence des éperons chez le *Crossoptilon auritum* et chez le *Phasianus wallichii*, deux espèces uniques dans tout le groupe des faisans, colorées modestement. Il y a quelques cas rares où le développement masculin, pour ainsi dire, des femelles atteint un degré extraordinaire, et alors c'est le sexe feminin qui prévaut. Ce sont le cas de la polyandrie, comme par exemple dans le genre *Turnix*, dont les femelles combattent pour la possession des mâles. Ici nous devons appliquer les remarques exposées plus haut aux femelles.

Je suppose cependant avec Mr. Wallace, que dans plusieurs cas les couleurs ternes des femelles doivent être expliquées par le besoin de les protéger contre les attaques des ennemis ; mais seulement il ne faut pas regarder comme leurs ennemis les oiseaux de proie et les quadrupèdes, mais aussi les mâles célibataires de la même espèce, et ce sont peut-être les ennemis les plus redoutables.

Dans les cas où le dimorphisme sexuel est faiblement développé et ne peut être expliqué par la seule action de la sélection naturelle, nous devons recourir à la loi de correlation de croissance, qui veut que certains changements dans la constitution de l'oiseau peut amener les changements dans différentes parties de son corps. Nous avons répété déjà plusieurs fois, que le rôle des femelles chez les oiseaux est beaucoup plus difficile que celui des mâles, et que dans plusieurs cas cette circonstance peut retarder son développement complet. On peut regarder la femelle dans ses formes extérieures comme un mâle non développé. Si donc nous prenons une espèce dont la femelle possède une riche coloration du mâle, mais aux teintes un peu plus ternes, comme par exemple dans le genre *Pharomacrus* (un Trogonidé), nous pouvons supposer que son développement est retardé (ou plutôt paralysé) par les difficultés surgis pendant l'époque de réproduction, c'est à dire par la présence d'ovaire, qui exige une nutrition plus grande que les glandes mâles. Cette supposition se confirme par le fait, que plusieurs femelles vieilles et malades, selon Darwin (et probablement qui ont perdu la fécondité), prennent les caractères mâles, puisque leur développement paralysé par les besognes maternelles atteint son plus haut degré depuis que la cause principale est supprimée.

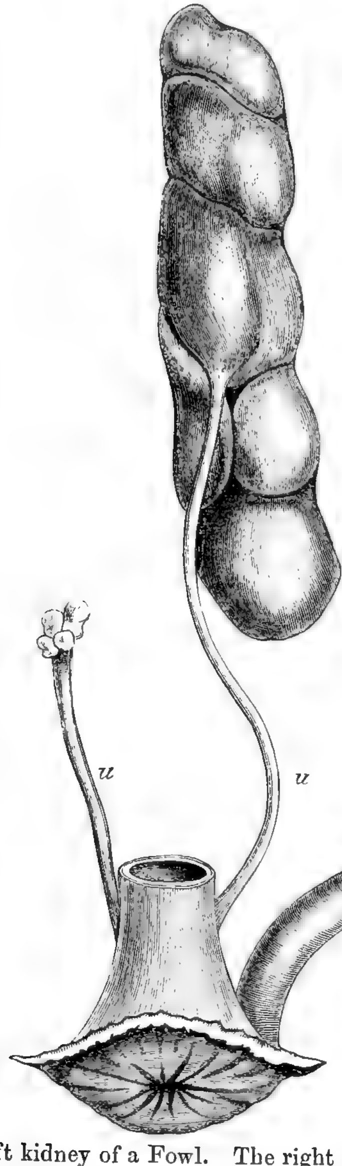
2. On Hypertrophy, and its Value in Evolution. By John Bland Sutton, F.R.C.S., Lecturer on Comparative Anatomy, Middlesex Hospital Medical College.

[Received March 23, 1885.]

Every known vertebrate normally possesses two kidneys, a right and a left one. In the case of the Fowl, the left kidney of which is represented in the drawing exhibited (fig. 1, p. 433), the right kidney had, from some cause or other, entirely disappeared, nothing but the ureter remaining to inform us of the previous existence of the associated kidney.

Such a case as this is by no means rare; it has been repeatedly observed in man. I have myself observed it in five instances in the human subject, also in sheep, oxen, horses, and twice in birds. It is not my intention to enter into details as to the cause of the disappearance of this kidney; it has been satisfactorily explained long ago; the important fact for my purpose is—that in this, as in similar cases of single kidney, the size and weight of the persistent organ far exceeds the normal, and in the majority of instances is

Fig. 1.



The cloaca and left kidney of a Fowl. The right one had disappeared, leaving merely the ureter *u*, with a small collection of tissue at its summit to testify that a right kidney had existed; *o*, the oviduct. The persistent kidney is twice the natural size.

double the usual size. The kidney, in consequence of the loss of its fellow, has had to perform twice the amount of work usually required of it, and has doubled its bulk as a result of this increased functional activity. The process by which this very desirable result has been attained is distinguished by the convenient term *hypertrophy.* Having illustrated what I understand by that term, let me now define it as "the enlargement of an organ beyond its usual limits as the result of increased function, or of some unusual condition of the corresponding or correlated organ."

The majority of instances of hypertrophy, usually recognized as such, are the result of disease. In the example just considered, the enlargement of the persistent kidney is the direct outcome of atrophy of its fellow; but if a careful inquiry be instituted, many conditions, which at first sight appear to be the result of perpetuated hypertrophy, in consequence of atrophy of neighbouring structures, will really admit another interpretation, viz. that the hypertrophy is in great measure responsible for the atrophy of those structures, and bears a definite relation to it.

No better example offers itself whereby my meaning may be elucidated than the middle metacarpal of the Horse.

The metacarpus of the Horse is composed of a greatly hypertrophied third metacarpal bone, whilst applied to the posterior lateral edges of this large bone may be seen two rudimentary metacarpals. Each of these bones represents a slender pyramid with its base upwards and the apex pointing directly downwards. Of the two bones the internal is thicker than the external, and often the longer of the two. The large bone represents the middle or third metacarpal, whilst its two slender companions correspond to the second and fourth metacarpals of the typical mammalian manus.

Thanks to the labours of Rütimeyer and Marsh, we are now in possession of the palæontological history of the ancestors of our modern Horse. The facts on this point, so far as regards the manus, have been admirably summed up by Wiedersheim [1] as follows:—

The oldest known stem form of the Horse is *Eohippus,* which has been found in the Lower Eocene of North America. It possessed four well-developed fingers and the rudiment of a fifth, the thumb. Next we find that the thumb has completely disappeared in *Orohippus* and *Epihippus,* the four remaining fingers persisting. These animals were about the size of a Fox, whilst in the Upper Eocene *Mesohippus* had attained the size of a Sheep. Here three fingers only were well formed; a fourth merely existed as a rudiment, which in the next form, *Miohippus,* has become yet smaller. In the Pliocene representative, *Protohippus,* the last remnant of a fourth finger disappears and three only persist. This animal corresponds to the European *Hipparion,* and was of the size of an Ass. Another Pliocene form, *Pliohippus,* had the second and fourth fingers extremely rudimentary, the development of the third being alone significant. Lastly, we come to the modern Horse, with its peculiarly specialized manus.

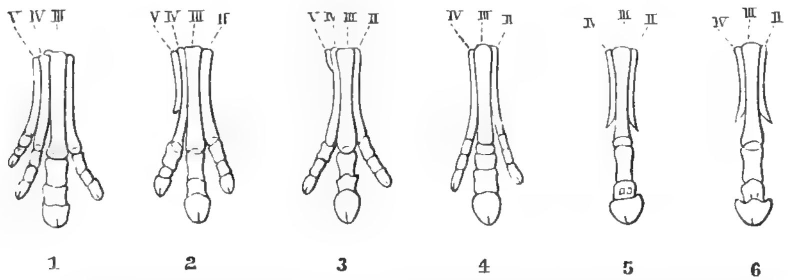
The accompanying figures are intended to afford a graphic representation of the preceding facts (fig. 2, p. 435).

[1] Vergl. Anatomie, vol. i. p. 198.

With such an array of evidence no one would venture to deny that the slender fourth and second metacarpals are rudimentary structures in the true sense and meaning of that term. These bones are often a nuisance to the animal, as they are exceedingly liable to inflame and produce lameness; the disease is known to veterinarians as splent-bone, and often ends in osseous ankylosis between them and the main metacarpal, a condition of things detrimental to the Horse for working purposes.

The history of this foot has been given, for it serves to illustrate a principle—hypertrophy of one structure leading to the atrophy of another; for in this case it seems the most probable view, that gradual increase in the size and functional importance of the third metacarpal bone has led to the abortion of the remaining bones, its original companions, by causing a diversion of the nutrient stream to its own advantage, but to the detriment of the lateral metacarpals.

Fig. 2.



A series of figures to show the ancestry of the manus of the modern Horse. 1. *Orohippus* (Eocene). 2. *Mesohippus* (Upper Eocene). 3. *Miohippus* (Miocene). 4. *Protohippus* (Upper Pliocene). 5. *Pliohippus*. 6. *Equus* (after Wiedersheim).

In no structure is this principle so admirably illustrated or so easily studied as in the teeth of mammals. Take, for example, the curiously modified teeth of the Walrus; we shall find the enlarged and formidable incisors have for their companions some tiny functionless teeth of no use whatever to the animal: as a rule they quickly fall; even when they persist, there are scarcely any sockets provided for their reception. In this case it can hardly be denied that hypertrophy of the canines has led to atrophy of the remaining teeth.

The Felidæ supply us with similar examples. The large size to which the canines attain in this group leads to atrophy of the teeth immediately adjacent to them. This process seems, so far as the Felidæ are concerned, to have reached its culminating point in the extinct *Machærodus*, or Sabre-toothed Tiger, in which the canines have attained considerable dimensions, whilst some of the premolars in the upper and lower jaws have disappeared.

Let us now consider some other examples of hypertrophied teeth somewhat different from the last. The extraordinary canines of the male *Babirusa* have afforded plenty of scope to those imaginative minds, who never come across anything out of the common but they must rack their brains to find out some useful purpose for which they think the abnormal organ may be utilized, never considering for one moment the absurdity of the explanation.

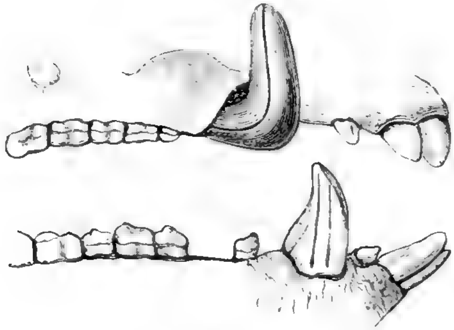
As is well known these teeth, like those of Rodents, grow from persistent pulps: if from any cause their growth is unopposed, as by want of antagonism between any two teeth, they grow to extraordinary length. In the case of the *Babirusa* it may readily be conceived that, from some cause or other, the upper and lower canines failed to come into apposition either by malformation or in a manner presently to be explained, and as a consequence grew enormously; the abnormality frequently recurring, the peculiarity became transmitted to the offspring, eventually becoming perpetuated to such a degree as to become a common feature in the anatomy of the males of this particular species.

Considered by itself, this isolated example perhaps does not carry much weight, but the condition may be approached insidiously from other specimens of the Suidæ. The first stage may be observed in the Wild Boar (of which the dentition is represented in fig. 3, p. 437), where the form and direction of the canines are peculiar. The lower canine is slender when compared with the upper, is of some length, and plays against the front surface of the upper one, becoming pointed in consequence. The upper canine passes at first horizontally outwards with an inclination forwards. After clearing the outer lip, its apex becomes directed upwards and inwards, describing in its course a semicircle. A similar condition is seen in the Wart-hog, *Phacochœrus æliani*; but the second stage is presented by *Phacochœrus æthiopicus*, in which the canine attains considerable proportions, as may be seen on reference to fig. 4 (p. 437).

In the third step we are confronted with *Babirusa*, whose excessive canines I maintain are inherited pathological peculiarities resulting from want of apposition, probably brought about in the first instance as a result of malformation (see fig. 5, p. 437).

It may, with reason, be asked, can an example be adduced of undoubted transmission of a pathological condition to the offspring so as to taint an entire community? An example offers itself in the so-called Tailless Trout of Islay. A careful and detailed account of this malformation is given by Prof. Traquair in the 'Journal of Anatomy,' vol. vi. p. 411. From this account it appears that the common Trout, *Salmo fario*, Linn., is frequently the subject of malformations, of which sigmoid distortions of the vertebral column and deficient development of the snout and jaws is the most common. In the present case, however, it is the caudal fin which is affected of all the Trout inhabiting a certain small lake. The most salient peculiarity of these Lochnamaorachan Trout is that the rays of the caudal fin are abnormally shortened, coarse at the extremities, and deficient as to the amount of dichotomization and number of the transverse joints; besides which they also show a tendency to coalesce at their terminations. By the convergence downwards of the upper long rays and upwards of the lower ones, the fin assumes

Fig. 3.

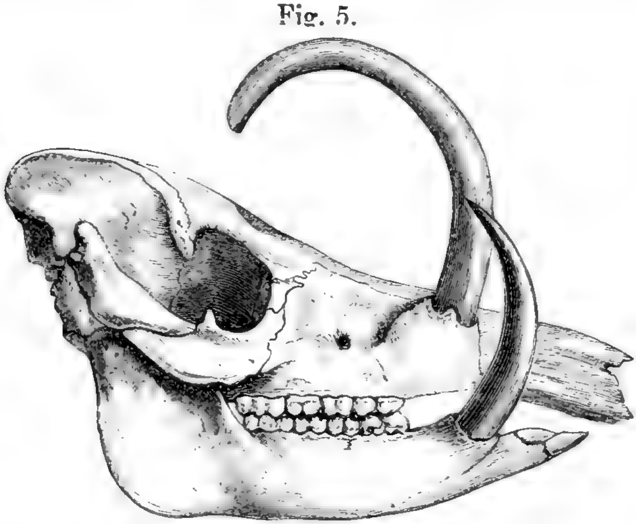


The dental series of a Wild Boar, showing the singular curve of the upper canine.

Fig. 4.

Head of Wart-Hog, *Phacochœrus æthiopicus*. ♂, showing a greater degree of curvature of the upper canine than that presented by the Wild Boar's tusk.

Fig. 5.



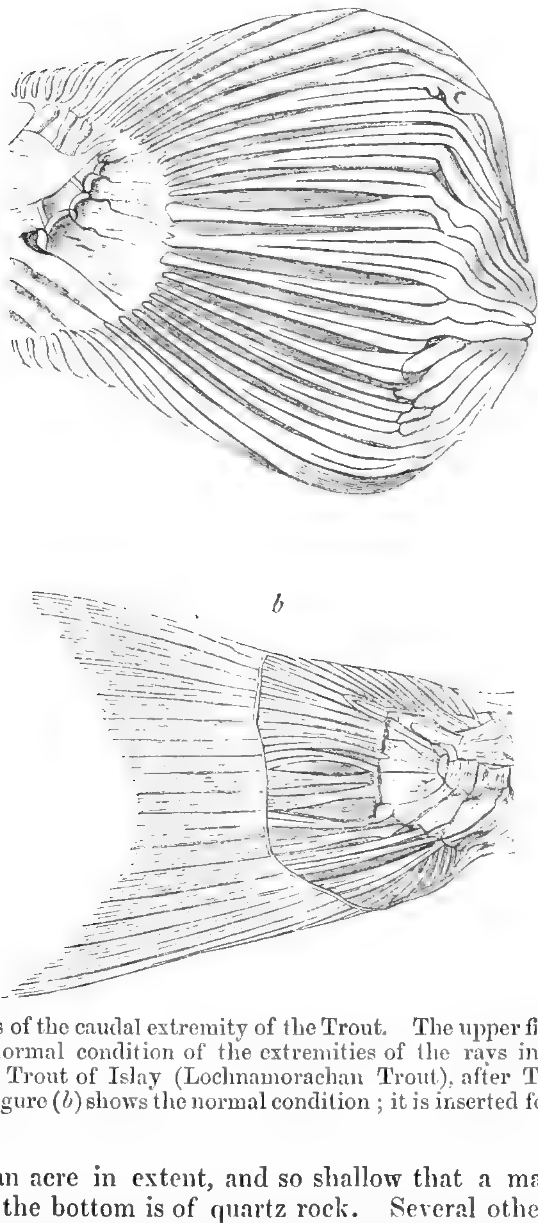
Skull of *Babirusa*, showing the most exaggerated stage of curved canines.

a rounded form instead of presenting the usual broad fan-shaped aspect. The abnormal condition of the extremities of the rays may affect other fins besides the caudal (fig. 6).

The lake in question is about 1000 feet above the level of the sea.

Fig. 6.

a



b

The hard parts of the caudal extremity of the Trout. The upper figure (*a*) shows the abnormal condition of the extremities of the rays in the so-called tailless Trout of Islay (Lochnamorachan Trout), after Traquair. The lower figure (*b*) shows the normal condition; it is inserted for comparison.

It is about an acre in extent, and so shallow that a man can wade through it: the bottom is of quartz rock. Several other lochs near contain Trout, but none are "tailless." So constant is this abnormality in Trout taken from the lake in question that one keen fisher, with thirty years' experience of this loch, has never taken any but docked ones.

It seems to me that these fish clearly inherit their deformity, and that it is a perpetuated pathological condition.

Returning to teeth, there can be little doubt that a similar process has been at work modifying the singularly aberrant tusks of the Narwhal, *Monodon monoceros*. Its huge size, the curious spiral twist, undoubtedly correlated with the peculiar unsymmetrical condition of the facial portion of the skull found in this Whale as well as among other members of the Physeteridæ, tend to support the notion of a pathological cause underlying these monstrosities.

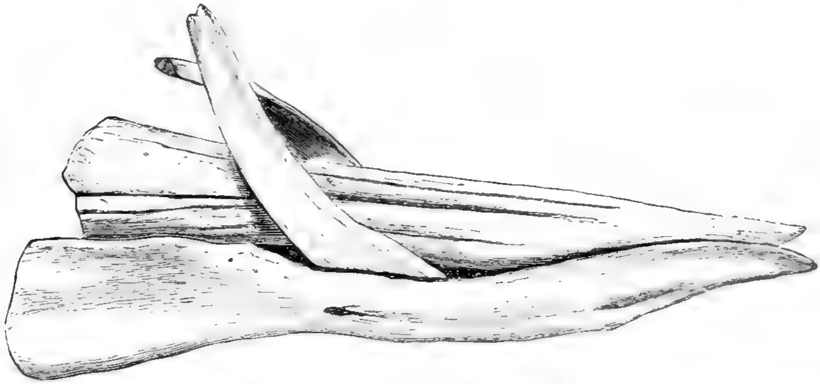
In this singular creature the adult male usually possesses a tooth growing from the left maxillary bone, in close relation with the maxillo-premaxillary suture and therefore regarded as a canine, which often attains a length of eight, nine, or even ten feet, with a basal diameter of four inches. The corresponding tooth of the opposite side usually undergoes development up to a certain point, and attains a size of six inches, but the pulp-chamber usually undergoes calcification before it has had time to make its way out of the alveolus, so that it remains concealed throughout the lifetime of the animal. Occasionally, however, this right tusk undergoes development, and equals in size the left one. Mr. J. W. Clark communicated to this Society in 1871 the results of an inquiry into the matter of double-tusked Narwhals, and has given in that very interesting paper details of no less than eleven bidental skulls of this Whale in different European Museums [1]. This seems to afford evidence that normally the Narwhal should possess two teeth, but that from some cause or other the right one often remains suppressed in the alveolus; and there is the significant fact, pointed out by Mr. Clark, that whenever a solitary tooth is present it is the left one, the right never being developed alone. The spiral twist in connection with these tusks always winds round them from right to left; if two tusks be developed, the twist of the spiral is in the same direction in both, as regards the skull right to left, whereas they appear unsymmetrical in respect to one another. There can be little doubt that this curious twist in the tusks is the effect of the same cause, whatever it may be, that produces the remarkable distortion in the facial portion of the skull of these whales. Prof. Flower has described, in the Trans. Odont. Soc. 1879–80, some curious Elephants' tusks contained in the Museum of the College of Surgeons. These tusks are spirally twisted, the twist possessing in some instances two or more turns: a deep groove extends from base to apex. In this instance it is clear that the malformation resulted from injury to the growing pulp when the tooth was in embryo. There is no just reason why the same line of argument should not be applied to the Narwhal tooth. The tusk has yet other interest for the pathologist. Professor Turner was fortunate enough to detect in the skull of a fœtal Narwhal two rudimentary teeth, all traces of which are lost in

[1] See P. Z. S. 1871, p. 42.

the adult, thus clearly showing that this animal originally possessed at least four teeth. After carefully reviewing these facts the conclusion forces itself upon me, that the modified dentition of this most singular animal has been attained by hypertrophy of its canine, leading to atrophy of its less used companions; but the original cause of the enlargement is as little known to us as is the cause of the asymmetry of its skull. There is probably no parallel to this in the animal kingdom—extreme hypertrophy, excessive atrophy, arrested growth, and malformation, exhibited in the dental armature of a single animal.

Among remarkable teeth must be included those of *Mesoplodon layardi*. The illustration (fig. 7) represents the anterior part of the rostrum and lower jaw with the teeth of the extraordinary specimen of this Whale brought home by the 'Challenger' Expedition. The

Fig. 7.



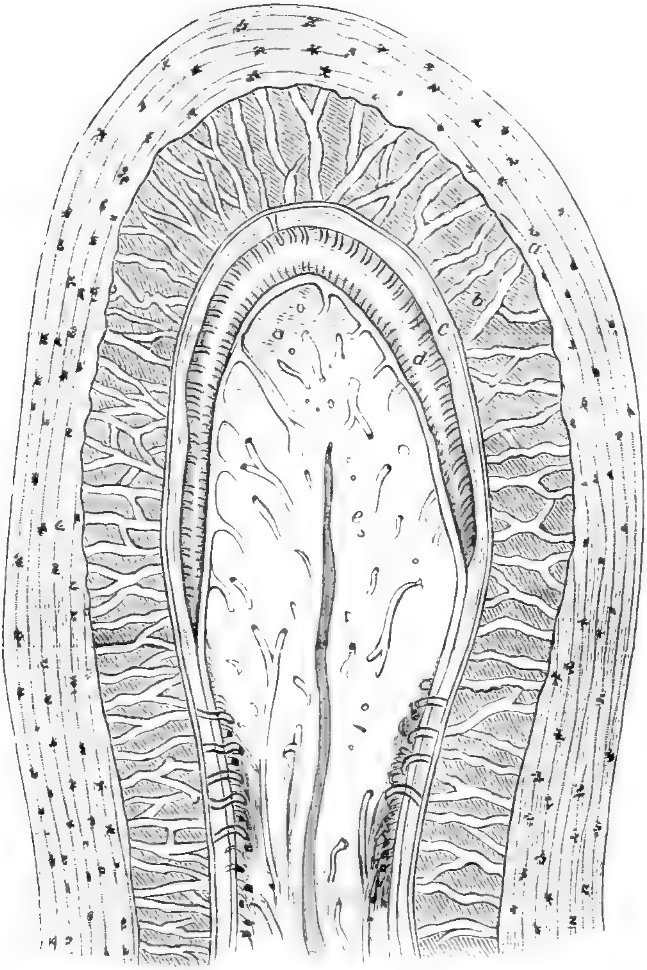
The rostrum of a Whale, *Mesoplodon layardi*, showing the singularly elongated and curved mandibular teeth. From the specimen obtained during the voyage of H.M.S. 'Challenger.' Figure taken from a cast in the Museum of the Royal College of Surgeons.

drawing was taken from a model of the specimen in the Museum of the Royal College of Surgeons, London. The specimen is thus described by Prof. Turner in his 'Report on the Bones of the Cetacea':—

"When I received from Mr. Moseley the lower jaw of the adult *Mesoplodon layardi*, only the left tooth was in its socket; the right had previously been extracted. The socket was situated at the junction of the symphysis with the body of the lower jaw, but more of the tooth was implanted in the body than in the symphysis. The length of the extracted tooth was 14 inches, $6\frac{1}{2}$ inches of which had been included in the alveolus, or surrounded by the gums. The breadth of the tooth where it emerged from the alveolus was $3\frac{1}{2}$ inches. Each tooth consisted of a denticle proper and a strap-shaped shaft. The shaft was laterally compressed, and as it emerged from the socket it curved obliquely backwards, upwards, and inwards, so that its inner concave surface had been in relation with the sides and dorsum of the beak. As the summit of each tooth passed to the opposite side of the middle line, the two teeth crossed each other on the dorsum of the beak; and from the smooth appearance of the anterior border and inner surface of each shaft, it is evident that they must have rubbed against each other, or against the beak during the movements of the lower jaw in the act of opening the mouth."

Besides this specimen, Prof. Turner also received the skull and

Fig. 8.



A magnified vertical transverse section through the summit of the shaft of the tooth of the adult *Mesoplodon layardi.* The tooth is made up of the following tissues, from above downwards: *a*, cement; *b*, vaso-dentine; *c*, a layer of more opaque modified vaso-dentine; *d*, dentine; *e*, modified vaso-dentine of the centre of shaft. (After Turner.)

parts of the skeleton of an immature *Mesoplodon layardi*, which enabled him to determine the nature of the various parts of this strange tooth. Each tooth in this immature specimen was two inches from before backwards, and not quite an inch long, and consisted of a small triangular denticle which represented the crown of the tooth, and of a larger part, which for descriptive purposes may be called the fang. The free surface of the denticle was invested with white enamel; subjacent to the enamel there was a well-defined mass of dentine which constituted the mass of the denticle. The exterior of the fang was coated with a thin layer of cementum, beneath which there was a thin layer of substance consisting of a granular matrix traversed by numerous canals, which were for the most part arranged perpendicularly to the surface of the fang, so as to extend from the dentine to the cementum. The pulp-cavity was lined throughout the greater part of its extent by a well-defined layer of this substance. The canals visible in this substance probably contained blood-vessels; in size they approximated to Haversian canals. This substance in all probability is vaso-dentine.

Turning, now, to the structural details of an adult specimen of these aberrant teeth, as seen in section (see fig. 8, p. 441), it will become evident, as Prof. Turner has explained, that the peculiar form of this tooth is due to changes in the fang, resulting from an enormous overgrowth of cementum and modified vaso-dentine, the former being produced from the alveolo-dentar periosteum, the latter from the pulp.

My reasons for regarding this singular tooth as a pathological peculiarity are these:—

1st. The elongated portion of the tooth really consists of the fang, and in many animals, even where the teeth do not grow from persistent pulps, there is a great tendency when the crowns are unopposed for the fangs to elongate (hypertrophy). This condition is often very conspicuous in old horses.

2nd. The nutritive conditions of the tooth are exceedingly advantageous for its hypertrophy: not only is it well supplied from the pulp, but its layers of vaso-dentine place it in suitable relation with the alveolo-dentar periosteum.

3rd. Judging from the condition of the crown of the tooth, even in adult Whales, it can be subjected to very little friction. Hence the structure, mode of nutrition, and lack of opposition, place this tooth in a very favourable condition to hypertrophy.

Before dismissing teeth, it will be well to point out how simple a matter it is to show that hypertrophy, especially if it be excessive, must almost of necessity lead to dwarfing of the structures more or less associated with it; this is particularly well illustrated in the case of the teeth. In man any tooth differs in size but little from those immediately adjacent; but if, as in the case of rodents, the incisors increase in size, out of all proportion to the neighbouring teeth, their augmentation in volume will lead to a "diversion of the nutrient stream" in their favour, but certainly to the detriment of the teeth immediately succeeding them in the dental series; and, as a matter of fact, these victimized teeth become so deprived of the essential element-blood, that they remain of stunted size, or have, in some cases, entirely disappeared. It must also be borne in mind that as the incisors increased in size, the effective employment of the succeeding teeth (canines and premolars in rodents) became reduced to a minimum, so that diminished usage would also tend to lower the vascular supply: thus the two factors, diminished function and diversion of nutrient fluid, have brought about extreme atrophy and, in many cases, total disappearance of teeth.

Numberless other instances might be quoted, indeed they must readily suggest themselves to any mind that carefully meditates on the matter. The cases of *Mesoplodon* and *Monodon* seem to me to be very extreme examples of this remarkable process.

I propose now to consider some examples of hypertrophy as they affect the reproductive organs; and shall adduce evidence to show that this process is one of the probable causes of division into sexes. Many anatomists are of opinion that hermaphroditism is the primitive condition of the sexual organs.

Hermaphrodites are found in every group of the animal kingdom, but, except in some of the lowest forms (such as *Ctenophora* and *Chrysaora*) among the Cœlenterata, self-fertilization appears to be wholly exceptional, and in those forms in which it occurs the entire process is of very simple character. The rule in hermaphrodites appears to be this:—The male organs in one animal are used to impregnate the female organs of another, or *vice versâ*. Even in the Cestoda, where there are arrangements favourable to self-impregnation, we have no positive evidence that it takes place.

From this arrangement it would easily come to pass that if one animal used the male portions of its reproductive organs more freely than the female parts, they would, as a result of increased function, hypertrophy.

In the first portion of this paper I emphasized the fact that any marked degree of hypertrophy in one organ nearly always leads to dwarfing of the correlated organ or sets of organs; hence in the example considered, the female portions of the hermaphrodite organs remain dwarfed or *in statu quo*. This peculiarity would in the natural course of events be transmitted to the offspring, until at last the differentiation attains such a high degree, that unless hypertrophy of one set of organs occurs in each individual, propagation is impeded. Evidence on this point is afforded by the developmental history (ontogeny) of any mammal. Whilst the two sets of reproductive organs, male and female, up to a certain point maintain the same degree of growth, it is impossible to determine the sex of the embryo. As soon as one set begin to enlarge at a greater rate than the other, the sex becomes pronounced. The remaining organs may eventually disappear or merely exist in such a rudimentary condition as to be discerned only by the most diligent search.

Indeed this process has been observed to occur in a very complete manner in a single group, the Myzostomida. Dr. L. von Graff, in his "Report on the Myzostomida" collected during the voyage of the 'Challenger,' has noted the following interesting facts. Some species (*Myzostoma tenuispinum*, *M. willemoesii*, *M. inflator*, and *M. murrayi*) are originally descended from androgynous forms in which the organs of one sex have become gradually aborted; for in *Myzo-*

stoma cysticolum the female has rudiments of testes, but no male generative aperture.

In those forms in which the individuals inhabiting one cyst are not different in appearance, the sexual organs have a different structure; each individual is here androgynous, but differs from the free living androgynous species in that the testis is developed only on one side of the body, and there is but one generative aperture. In *Myzostoma pentacrinus*, however, there are small remnants of the other testis, but no second male aperture. The testis also, as in the diœcious forms, is a small compact gland. Since the testes of the dwarf males are fully developed on both sides, we must not regard the hermaphrodite species *M. pentacrini* and *M. deformatum* as transitional between the typical hermaphrodite forms and those that are diœcious, but the latter must be derived independently from living forms.

In *M. cysticolum* the male and female are found associated in a common cyst, and increasing in size with the growth of the cyst perforate the arm-joints of their host together. The growth of the cyst is, of course, caused by the presence of the parasite; the female deposits her eggs within the cyst, and the young embryos, after they have abandoned the cyst and lost their ciliated coat, associate together in pairs, and bore their way through the arm-joints. In both the sexual development begins with the appearance of testes; but in the female the testes disappear entirely, or leave but a minute rudiment, when the ovaries make their appearance in addition [1].

Among the most striking examples of the peculiar value of hypertrophy in this direction must be mentioned the curious malformed generative organs which occur in the cattle known as "Free-martins." Hunter was one of the first to carefully investigate the condition of the reproductive organs in these cases; and the valuable dissections he made, now in the Hunterian Museum, are striking monuments of his inquisitiveness in this matter.

Stock-breeders hold the opinion that when a cow produces twins, one a male and the other a female, the latter is unproductive (imperfect). This is very frequently true, but by no means always so. An imperfect calf under these conditions is known as a Free-martin or Martin-heifer. Careful comparison of the detailed descriptions of the dissections of these malformations, and similar cases in Sheep and Goats which have come under my observation, show most conclusively that in these cases we have to deal, not with any one malformation common to all examples of Free-martins, but rather with instances in which both sets of organs have attempted to attain a functional condition, with the result that both have failed to reach it. In some of these cases the Wolffian ducts have advanced many stages towards making a fairly complete set of efferent ducts for the testicles, and the calf approaches somewhat to a bull-calf. In other instances the Müllerian ducts have made greatest progress, and a

[1] I am indebted to Mr. F. Beddard for drawing my attention to these interesting observations of Dr. von Graff.

diminutive uterus can be made out, and in this case the calf most resembles a cow-calf. Between these two extremes there is every gradation and variation. Similar cases occur in fishes, reptiles, amphibians, birds, &c. I have seen many cases, and numberless instances have been recorded out of curiosity.

These cases show most conclusively how impossible it is for both sets of reproductive organs to attain a functional condition in the same individual. Hypertrophy of one set must arise and establish pre-eminence over the other.

The facts on which the argument rests, that hypertrophy is one of the causes of division of sexes, may be summarized as follows:—

(1) In the lowest forms of animal life, hermaphroditism is the prevailing condition.

(2) Cross-fertilization in hermaphrodites is the rule, and may, as in some of the *Myzostomata*, lead to a division into sexes within the limits of a single group.

(3) Sporadic cases of hermaphroditism are far more common in the lowest forms of life.

(4) If in mammals both sets of organs grow concurrently, the individual is sterile.

(5) Both sets of organs grow equally to a definite period in embryonic life.

(6) Reproduction in Vertebrata, so far as is known, is impossible unless hypertrophy of one set of organs occur.

In conclusion let me point out, that my object in writing this paper is to endeavour to substantiate the doctrine that pathological processes do not exist *per se*, but that in all cases they are to be regarded as physiological processes in excess. I trust the view has been clearly expressed so far as concerns the very important process, hypertrophy.

Lastly, let me emphasize my meaning, that in many cases where organs or sets of organs have undergone hypertrophy to such a degree that pathologists would regard them as abnormal, these exceptional conditions have been inherited, and in this sense *pathology* may be assumed to have played a part among the ordinary processes of evolution in producing race peculiarities.

3. On the Remains of a Gigantic Species of Bird from Lower-Eocene Beds near Croydon. By E. T. Newton.

[Abstract.[1]]

This paper describes certain bones of a large size obtained by Mr. H. M. Klaassen from the Lower-Eocene strata near Croydon, which are referable to a bird as large and heavy in build as the extinct *Dinornis crassus* of New Zealand.

After a detailed account of each of the specimens, which include parts of three or four tibio-tarsi, and a femur, they are compared

[1] This paper will be published entire in the Society's 'Transactions.'

with the corresponding bones of other Eocene birds, and referred to the genus *Gastornis*, but they are named specifically after their discoverer, *Gastornis klaasseni*. The lower ends of these tibio-tarsi being more perfect than in any of the examples of the genus which have been discovered on the continent, a more detailed comparison with other forms of birds is now possible, and confirms to a great extent the opinions which have been expressed by previous writers as to the affinities of these ancient birds. The tibio-tarsus of *G. klaasseni* is unlike that of any known bird; that of *Dinornis* and the living Ratitæ, although approaching it in size, are quite unlike it in form. It is among the Anserine birds that one finds tibio-tarsi with the greatest number of characters in common with these fossils; and if the form of the tibio-tarsus is any indication of the affinities of birds, then *Gastornis* would seem to find its nearest living allies among the old group of the Palmipedes, and more especially in the Anserine division of that group. Notwithstanding this there is evidence which seems to point to *Gastornis* being one of the Ratitæ.

The paper concludes with a list of all the known British Eocene Birds, and a short description of the geological strata at Croydon from which these fossils were obtained.

4. Description of a new Species of Hornbill from the Island of Palawan. By R. Bowdler Sharpe, F.L.S., F.Z.S., &c.

[Received April 14, 1885.]

(Plate XXVI.)

Three specimens of a Hornbill obtained in Palawan by my friend Mr. Everard P. Lempriere appear to belong to an undescribed species of *Anthracoceros*. In Capt. Wardlaw Ramsay's list of Philippine birds, no species of Hornbill has been recorded from Palawan; so that it is interesting to find the family represented in the island, and still more so as the species turns out to belong to the Indo-Malayan genus *Anthracoceros*, thus affording another instance of the Malayan affinities of Palawan.

The present species is easily diagnosed for its completely black wings and entirely white tail, so that the following brief description of it will suffice.

Anthracoceros lemprieri, sp. n. (Plate XXVI.)

♂ ad. *omnino niger, vix viridescens; alis nigris; cauda omnino alba. Long. tot.* 26, *alæ* 12, *caudæ* 10·0, *tarsi* 2·25.

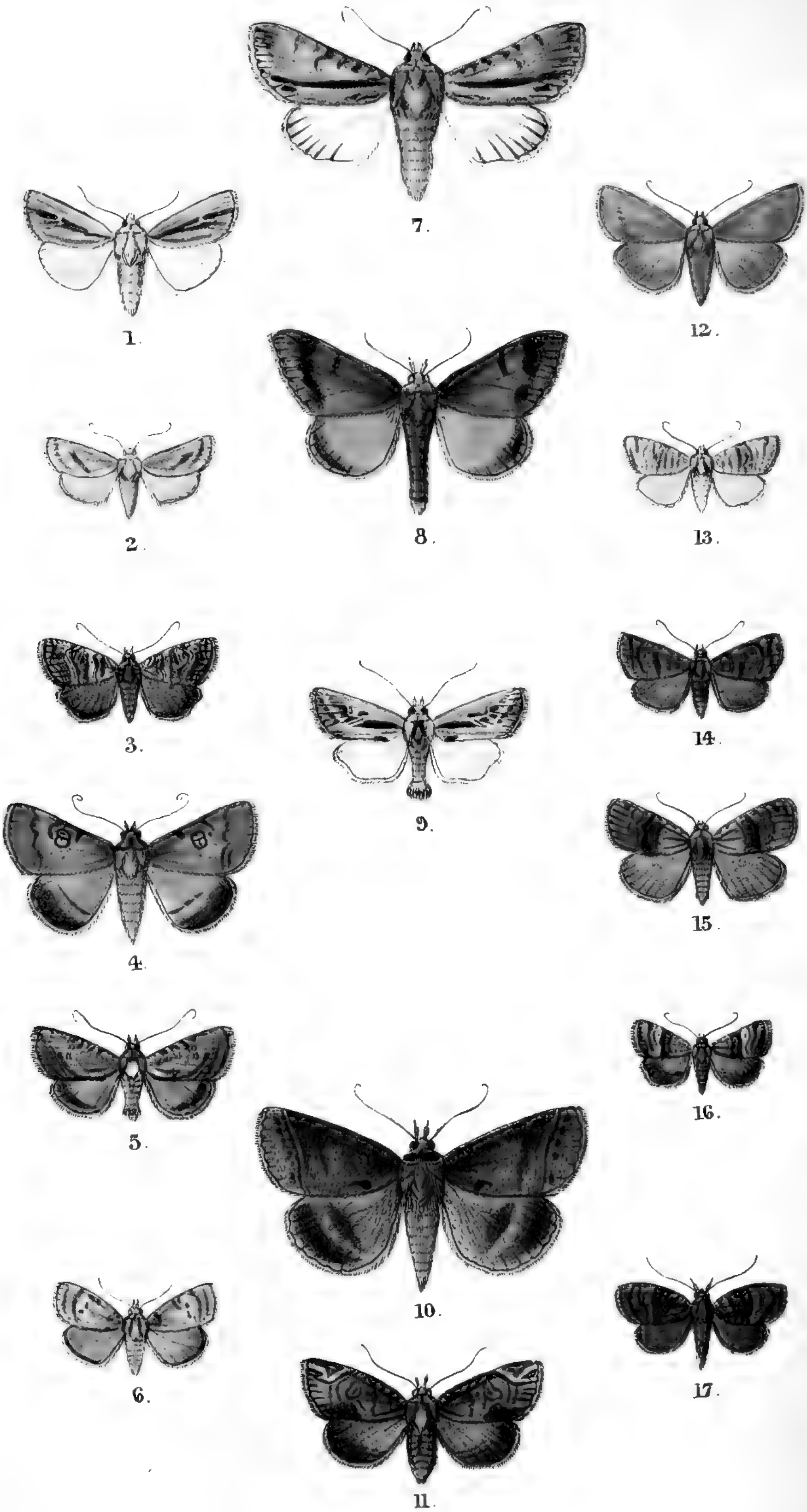
Hab. in insula Philippinensi "Palawan" dicta.

The bill is yellowish white with the base of the lower mandible black; a bird with a smaller casque I take to be the adult female. The young has an admixture of brown in the plumage and lacks the pointed apical ridge to the casque.

eulemans lith.

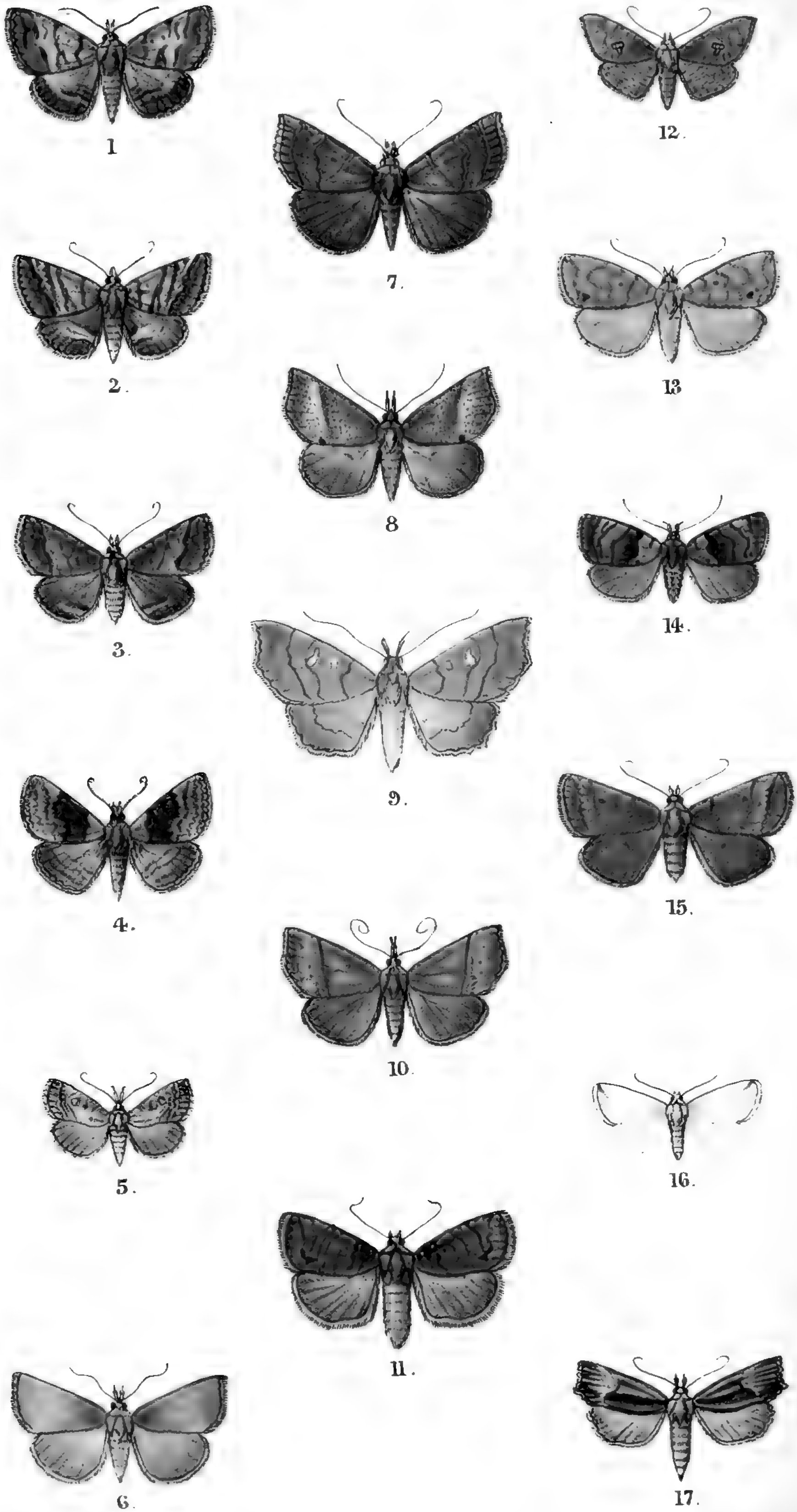
Hanhart imp.

ANTHRACOCEROS LEMPRIERI.



F. C. Moore del et lith. Mintern Bros. imp.

NEW INDIAN LEPIDOPTERA



F. C. Moore del et lith.

Mintern Bros. imp.

NEW INDIAN LEPIDOPTERA.

5. On the Lepidoptera of Bombay and the Deccan.—Part III. Heterocera (*continued*). By Lt.-Col. C. Swinhoe, F.L.S., F.Z.S.

[Continued from p. 307.]

[Received April 28, 1885.]

(Plates XXVII., XXVIII.)

NOCTUES.

Bombicoidæ.

1. Karana decorata.

Karana decorata, Moore, Desc. Lep. Col. Atkinson, ii. p. 107 (1882).

Poona, October; Sattara, June.

Leucaniidæ.

2. Leucania extranea.

Leucania extranea, Guénée, Noct. i. 77, 104.

Poona, November and December; Bombay, February.

3. Leucania loreyi.

Leucania loreyi, Duponchel, Hist. Nat. Lep. France, iv. 81, pl. 105. f. 7.

Poona, November; Bombay, February.

4. Leucania polemusa, n. sp. (Plate XXVII. fig. 1.)

Poona, September and October; Bombay, July.

Allied to *L. decisissima*, Walker, but of altogether a different colour. Pale greyish-fawn colour, shining. Abdomen very pale greyish. Fore wings with a brownish stripe, which extends from base to the outer margin, containing a small silvery streak turned up at the end of the cell; numerous blackish longitudinal lines covering the whole wing, with the exception of a small space just below the cell. A discal row of black points, from near the apex to the hinder margin; absent in some specimens. Hind wings glistening white.

Expanse of wings $1\frac{2}{10}$ to $1\frac{4}{10}$ inch.

5. Leucania subsignata.

Leucania subsignata, Moore, P. Z. S. 1881, p. 336.

Bombay.

6. Sesamia inferens.

Leucania inferens, Walker, ix. 105.

Bombay, September and October.

7. Axylia renalis.

Axylia renalis, Moore, P. Z. S. 1881, p. 341.

Poona, July, September, and October.

8. Axylia furtiva, n. sp.

Poona, October and December.

Thorax and fore wings shining chocolate-brown, with a longitudinal fascia below the cell and many longitudinal streaks pale pinkish; orbicular and reniform spots very prominent, pale pinkish, interlined with brown, the latter very large; outer border with black points. Hind wings smoky brown, paler towards the base, glistening; fringe pinkish luteous; abdomen whitish.

Expanse of wings $\frac{9}{10}$ inch.

Discordia, gen. nov.

Wings long: fore wing narrow; costa almost straight, exterior margin obliquely convex; posterior margin convex; cell extending three fifths the length; first and second subcostals from close to end of cell, third trifid; radials from end of the discocellular; middle median from close to end of cell, lower at one fifth; submedian slightly recurved. Hind wing long, narrow, exterior margin very obliquely convex; cell half the length; two subcostals from end of cell; upper costal running close to the costal for one third its length; discocellular bent inward before the middle, lower end long and outwardly oblique; radial from close to its lower end; middle median from close to end of cell, lower at one third; body rather stout; palpi minute, pilose; antennæ filiform; legs rather stout, squamous.

9. Discordia evulsa, n. sp. (Plate XXVII. fig. 2.)

Poona, November.

Antennæ, palpi, head, and body pale grey. Fore wings pinkish grey, with grey irrorations which form dark shades on the basal half of the costa and of the hinder margin; a grey band from the centre of the hinder margin to the costa, near the apex, outwardly dentated; marginal line brown; fringe interlined—white, brown, and white. Hind wings shining white.

Expanse of wings $\frac{8}{10}$ inch.

Heliothidæ.

10. Heliothis armigera.

Noctua armigera, Hübner, Noct. pl. 79. f. 370.

Bombay, August and September.

11. Heliothis rubescens.

Thalpophila rubescens, Walker, xv. 1681.

Bombay, October.

12. Heliothis peltigera.

Noctua peltigera, Denis, Wien. Verz. 89. 2.

Poona, April to June.

13. Heliothis juncea, n. sp. (Plate XXVII. fig. 4.)

Bombay.

Thorax and fore wings of a dull red colour; front of thorax and head of a brighter red; reniform stigma large, white, encircled with black; two black marks running in from the costa, one before and the other beyond the middle, like the commencement of latitudinal wavy lines; a discal double wavy blackish line, and an indistinct marginal blackish line; hind wings reddish grey, with a broad marginal uninterrupted blackish-brown band; fringe reddish grey; abdomen reddish grey.

Expanse of wings $1\frac{3}{10}$ inch.

14. Anthœcia swinhoei.

Anthœcia swinhoei, Butler, P. Z. S. 1883, p. 162.

Poona, October to December.

15. Pradatta decorata.

Pradatta decorata, Moore, P. Z. S. 1881, p. 365.

Poona, October.

16. Pradatta bivittata.

Leucania bivittata, Walker, ix. 108.

Bombay, September.

17. Adisura leucanioides.

Adisura leucanioides, Moore, P. Z. S. 1881, p. 368.

Poona, September.

18. Adisura marginalis.

Adisura marginalis, Moore, P. Z. S. 1881, p. 368.

Bombay.

19. Adisura uncta, n. sp. (Plate XXVII. fig. 12.)

Bombay, October.

Allied to *A. leucanioides*. Fore wings yellowish, suffused all over with pink, leaving the ground colour showing through in one or two places; some dark pink lines between the veins, in the disk; fringe dark pink, edged with silvery white: hind wings pinkish grey, paler towards the base, shining; fringe luteous.

Expanse of wings 1 inch.

20. Curubasa calamaria.

Curubasa calamaria, Moore, P. Z. S. 1881, p. 367.

Bombay, October.

Glottulidæ.

21. Chasmina cygnus.

Chasmina cygnus, Walker, ix. 147.

Bombay, September.

22. Polytela gloriosæ.

Bombyx gloriosæ, Fabr. Sp. Ins. ii. 205, 150.

Poona, July; Bombay, July.

Larva feed on *Polianthus tuberosa*: colour very dark velvety maroon, with cream-coloured spots; size $1\frac{1}{2}$ inch. They burrow and eat the roots of the plant as well as the leaves. Larval stage 24 days; a moth emerged occasionally, from after a few days, right up to the March following; larvæ burrow into hard soil when turning and form small chambers.

Apamiidæ.

23. Prodenia retina.

Neuria retina, Frivaldsky, Herr.-Schäff. Eur. Schmett. ii. p. 292, Noct. pl. 29. f. 145.

Poona, July to September; Bombay, July to November.

24. Prodenia glaucistriga.

Prodenia glaucistriga, Walker, ix. 197.

Poona, June; Bombay, July and August.

25. Laphygma infecta.

Prodenia infecta, Walker, ix. p. 196.
Prodenia venustula, Walker, xxxii. p. 654.

Poona, July, October, and November; Bombay, August to December.

26. Laphygma exigua.

Noctua exigua, Hübner, Samml. eur. Schmett. Noct. f. 362.

Poona, September; Bombay, December.

27. Apamea viriata, n. sp.

Poona, July.

Antennæ and palpi brown; head and body brown, marked with pale pinkish grey. Fore wings dark brown; costa with pinkish-grey spots; subbasal, antemedial, and postmedial lines deep black, lunular, the two former edged inwardly, and the last edged outwardly, with pinkish grey; nearly the whole space between the postmedial line and the margin more or less of the same colour, forming a broad band deeply denticulated in its centre outwardly, with two teeth running into the dark-brown colour of the wing on the outer margin; marginal spots purplish grey; fringe brown, speckled with the same colour; orbicular and reniform marks large, indicated by large rings of deep black, the latter slightly excavated outwardly; hind wing whitish, with a deep costal and marginal suffused greyish border; fringe pinkish grey, edged with white.

Closely allied to *A. latifasciata,* Moore, P. Z. S. 1881, p. 345.

Expanse of wings $1\frac{5}{10}$ inch.

28. Apamea mucronata.

Apamea mucronata, Moore, P. Z. S. 1881, p. 345, pl. 38. f. 8.
Poona, October.

29. Ilattia cephusalis.

Ilattia cephusalis, Walker, xvi. p. 209.
Poona, September to November; Bombay, July to November.

30. Sasunaga tenebrosa.

Hadena tenebrosa, Moore, P.Z.S. 1867, p. 59; id. 1881, p. 343.
Poona.

31. Hydrilla denticulosa.

Miana denticulosa, Walker, xxxii. p. 676.
Poona, September and October; Bombay, July.

32. Mamestra dolorosa.

Mamestra dolorosa, Walker, xxxii. p. 667.
Sattara, Poona, November.

33. Spodoptera cilium.

Spodoptera cilium, Guénée, Noct. i. pp. 156, 249.
Poona, September and December; Bombay, December.

34. Caradrina bremusa, n. sp.

Poona.

Head, thorax, and fore wings grey, dotted with black atoms; eyes black; first joint of palpi brown, last two joints white. Fore wings with three black spots on the costa, the first two being the commencement of a subbasal and antemedial outwardly waved interrupted black line, a postmedial brown interrupted waved line or band, then a straight row of deep black points, and the rest of the outer portion of the wing so thickly covered with brown atoms as to form three bands close together, making the outer third of the wing quite dark, marginal points black. Hind wings greyish white, darker towards the costa; apex and outer border brownish. Abdomen grey.

Expanse of wings $1\frac{1}{10}$ inch.

35. Caradrina insignata.

Caradrina insignata, Walker, x. p. 295.
Poona, September.

36. Peregea serva.

Celena serva, Walker, xv. p. 1689.
Bombay, October.

37. Peregea centralis.

Peregea centralis, Walker, xi. p. 734.
Poona, September.

38. Peregea supplex, n. sp.

Poona, July; Bombay, July.

Allied to *P. centralis*, Walker.

Reddish grey, shining; redder and darker on the basal half; basal, antemedial, postmedial, and submarginal slightly waved, single grey lines, indistinct; reniform stigma whitish, distinct; hind wings and abdomen grey.

Expanse of wings $\frac{9}{10}$ inch.

39. Rhizogramma unilinea, n. sp. (Plate XXVII. fig. 7.)

Poona.

Fore wings slaty grey, with a black band running below the cell, curving slightly downwards in its centre, and extending from the base to the outer border; a dark grey diffused band on the hinder margin; marginal line white, with black dots; fringe grey. Hind wings pure white, greyish towards the costa and outer border. Body slaty grey.

Expanse of wings $1\frac{7}{10}$ inch.

40. Ozarba itwarra, n. sp. (Plate XXVII. fig. 14.)

Poona, October.

Fore wings blackish brown; costa with seven yellow spots; subbasal and antemedial lines nearly straight, double, black, edged with whitish; a postmedial double white line, edged with black on the inner side, sharply bent inwardly to the costa, over the large well-defined reniform stigma, which is composed of two white lines, the inner one edged with black; the orbicular is indistinct, and is almost effaced by the antemedial double line; a submarginal single white line bent outwardly, just below its centre; a marginal line of deep black connected lunules, edged on both sides with white. Hind wings dark brown, unmarked; fringe of both wings long, interlined brown, white, and brown.

Expanse of wings $\frac{9}{10}$ inch.

41. Ozarba mallarba, n. sp. (Plate XXVII. fig. 3.)

Poona, December.

Fore wings pale reddish, covered with brown atoms; orbicular and reniform stigmas deep black, distinct, the former the larger; a central blackish shade, commencing from the orbicular and widening on the hinder margin; inner line upright, slightly waved; outer line zigzag, bent outwards, whitish; submarginal line also whitish, nearly straight, marginal points black. Hind wings pale brown; fringe pinkish white and brown.

Expanse of wings $\frac{9}{10}$ inch.

42. Ozarba punctigera.

Ozarba punctigera, Walker, xxxii. p. 685.

Sattara, June; Poona, September and October; Bombay, October.

Noctuidæ.

43. Agrotis conspurcata.

Agrotis conspurcata, Walker, xxxii. p. 696.
Poona, October.

44. Agrotis segetum.

Phalena-Noctua segetis, Gml. ed. Syst. Nat. i. v. 2539, 1018.
Noctua segetum, Wien. Verz. lxxxi. p. 12, pl. i. figs. *3a, b.*
Poona, December.

45. Agrotis suffusa.

Phalena-Noctua suffusa, Gml. ed. Syst. Nat. i. v. 2541, 1028.
Poona.

46. Agrotis aristifera.

Agrotis aristifera, Guénée, Noct. i. pp. 266, 426.
Poona, December to March.

47. Agrotis vana, n. sp. (Plate XXVII. fig. 9.)

Sattara, June; Poona, August and September.

Pale yellowish fawn-colour; antennæ brown; palpi with the first and last joints brown, last joint white-tipped; eyes black; thorax with a black band in front, and with a large square deep black patch in the centre of the prothorax. Fore wings with a deep black, much interrupted band from the base, gradually widening to the outer margin, which it would almost fully occupy except for the interuptions by which it is divided into five parts: the interruptions consist of whitish streaks, extending from along the median and subcostal veins, and another streak of the same colour, from the apex downwards, joining the median-vein streak on the second median branch, near its root; hinder margin with a small deep black mark near the base; marginal line white, inwardly edged with black; fringe brown. Hind wings white, slightly shaded towards the outer margin.

Expanse of wings 1 to $1\frac{2}{10}$ inch.

48. Graphiphora c-nigrum.

Phalæna-Noctua c-nigrum, Linn. Faun. Suec. p. 1193.
Bombay, February.

49. Graphiphora cognata.

Graphiphora cognata, Moore, Desc. Lep. Col. Atkinson, ii. p. 119 (1882).
Poona, September and December.

50. Ochropleura triangularis.

Ochropleura triangularis, Moore, P. Z. S. 1867, p. 55.
Sattara, November.

Hadenidæ.

51. Hadena indistans.
Hadena indistans, Guénée, Noct. ii. pp. 87, 786.
Poona, October; Bombay, October.

52. Euplexia semifascia.
Hadena semifascia, Walker, xxxiii. p. 737.
Sattara, November.

Acontiidæ.

53. Xanthodes innocens.
Xanthodes innocens, Walker, xv. p. 1752.
Bombay, February and October.

54. Xanthodes stramen.
Xanthodes stramen, Guénée, Noct. ii. pp. 210, 976
Poona, July and September.

55. Xanthodes transversa.
Xanthodes transversa, Guénée, Noct. ii. pp. 211, 978.
Poona, July; Bombay, August, September, and October.

56. Xanthodes imparata.
Xanthodes imparata, Walker, x. p. 467.
Bombay, July.

57. Pitacota terminigera.
Felinia terminigera, Walker, xv. 1850.
Poona, July.

58. Tarache postica.
Calophasia postica, Walker, xxxiii. p. 764.
Poona, October.

59. Calophasia upsilon.
Calophasia upsilon, Walker, xxxiii. p. 763.
Poona, October.

60. Acontia basifera.
Acontia basifera, Walker, xii. p. 793.
Poona, October.

61. Acontia costalis.
Acontia costalis, Walker, xxxiii. p. 784.
Poona, October.

62. Acontia quadripartita.
Acontia quadripartita, Walker, xxxiii. p. 786.
Poona, October.

63. Acontia quintana, n. sp. (Plate XXVII. fig. 13.)

Poona, October and November.

Antennæ, palpi, head, and thorax blackish brown; abdomen white; wings silvery white. Fore wings with blackish bands and lines—one basal, with thin black spots on the margin, followed by a sinuous line; a broad median band, containing a deep black spot, margined with whitish, followed by two interrupted sinuous lines; an interrupted submarginal band; and a broken marginal band: hind wings unmarked.

Expanse of wings $\frac{8}{10}$ inch.

64. Acontia scanda.

Acontia scanda, Felder, Reise der Nov. pl. 108. f. 27.

Bombay, September.

65. Acontia crocata.

Acontia crocata, Guénée, Noct. ii. pp. 218, 989.

Poona, October; Bombay, July, August, and September; very plentiful in Bombay in July.

66. Acontia firina, n. sp. (Plate XXVII. fig. 5.)

Poona; Bombay, November.

Antennæ, palpi, head, and thorax reddish brown; abdomen whitish. Fore wings pinkish yellow, with black marks along the costa, and black dots, mostly arranged in squares of four dots to each, along the upper part of the wing above the median vein; hinder margin broadly brown, a brownish thin band from the centre of the hinder margin to the outer margin near the apex, a large square black spot in the centre of this band, a black line from the outer third of the hinder margin, running upwards towards the costa, across the band, joining three squares of black dots that come down from the costa; the entire space between the band and the hinder angle suffused with brown; marginal points black; fringe pinkish brown, black towards the hinder angle. Hind wings pale whitish testaceous, with a broad diffused, brownish, marginal border; marginal line brown; fringe pale pinkish brown.

Expanse of wings 1 inch.

67. Acontia excisa.

Acontia excisa, Walker, MS. Brit. Mus. Coll.

Poona, October.

Antennæ, head, thorax, abdomen, and fore wings brownish black; palpi with the first joint reddish brown, second black, last joint very minute and pure white; abdomen with a white band at the base. Fore wings with broad white antemedial and marginal bands, the former sometimes tinged with reddish, the latter marked with black at the apex, and in the centre two deep black incomplete sinuous medial lines and a white sinuous double outer line, clouded in some specimens, but always distinct on the costa; reniform mark represented by two deep black spots; first white band with a line of black spots running through it; marginal points black, distinct. Hind wings grey; fringe whitish.

Expanse of wings $\frac{6}{10}$ inch.

68. Acontia opella, n. sp. (Plate XXVII. fig. 16.)

Poona, October.

Antennæ brown; head brown, with a white band on each side in front of the eyes; body brown. Fore wings with the basal third brown, margined with a whitish line, then a black band, followed by a white line and a brown line against each other, opening out and passing to the costa, one on each side of the reniform stigma, which is represented by a brown streak on a whitish-grey ground; these marks are followed by a uniform grey band, a brown band which expands on the costa, a reddish-grey line, which also expands on the costa, filling up the apical space; a thick blackish-brown band on the lower two thirds of the outer margin, margined inwardly with deep black; a deep black marginal line; fringe long, greyish-brown, with yellowish markings. Hind wings pale soot-colour, with four or five whitish spots at the apex.

Expanse of wings $\frac{8}{10}$ inch.

69. Acontia pulla, n. sp. (Plate XXVII. fig. 15.)

Poona, October and November.

Body and fore wings pale reddish-brown; fore wings with the central portion suffused with dark brown, across which are two sinuous lines, one antemedial, the other postmedial; costa and apex with brown marks; marginal line reddish; marginal points brown; fringe pale reddish. Hind wings soot-brown; fringe pale reddish.

Expanse of wings $\frac{9}{10}$ inch.

70. Marimatha pura, n. sp. (Plate XXVIII. fig. 16.)

Poona, October.

Greyish milky-white; head and thorax with some deep black speckles, a reddish patch at apex of fore wing, otherwise quite unmarked; fringe reddish. It is, however, a variable species. In one example there are no speckles on the head and thorax; in another there are some deep black speckles in a cluster in the centre of the fore wing, and in another the general colour is slightly reddish.

Expanse of wings $\frac{9}{10}$ inch.

71. Prothe~~o~~des veprecola, n. sp.

Poona, September and October. Very plentiful.

Antennæ, palpi, head, thorax, and fore wings brown; abdomen and hind wing whitish testaceous; fore wing with orbicular and reniform marks whitish, rather indistinct; basal, antemedial, postmedial, and submarginal whitish, very indistinct waved lines, often obsolete; some brown flecks on the wing, here and there; fringe blackish; hind wings unmarked; underside whitish shining, unmarked.

Expanse of wings $\frac{8}{10}$ inch.

Anthophilidæ.

72. Thalpochares rivula.

Thalpocharis rivula, Moore, Desc. Lep. Col. Atkinson, ii. p. 140 (1882).

Bombay.

73. Thalpochares uberosa, n. sp.

Poona, September and October. In great abundance during the latter month.

Iron-grey ; fore wing with antemedial, postmedial, and submarginal double white lines, the second branching off in its double state, encircling the reniform stigma, and meeting again on the costa ; marginal line black : hind wing with a black marginal line, otherwise unmarked ; underside of a dark uniform iron-grey.

This insect varies somewhat in its coloration, some of the specimens in my collection having a reddish tinge.

Expanse of wings $\frac{7}{10}$ inch.

74. Hiccoda dosaroides.

Hiccoda dosaroides, Moore, Desc. Lep. Coll. Atkinson, p. 135 (1882).

Poona, June.

Eriopidæ.

75. Callopistria recurvata.

Callopistria recurvata, Moore, Desc. Lep. Col. Atkinson, ii. p. 144 (1882).

Bombay, September and November.

Eurhipidæ.

76. Penicillaria jocosatrix.

Penicillaria jocosatrix, Guénée, Noct. ii. pp. 304, 1112.

Poona, September ; Bombay, July.

Larvæ feed on *Mangifera indica*, found in groups of five or six on the underside of the leaf ; length $1\frac{1}{4}$ inch ; colour watery green ; pupa like the pupa of *Polytela gloriosæ*, but rather smaller.

77. Eutelia favillatrix.

Eutelia favillatrix, Walker, xv. p. 1778.

Bombay, September.

78. Targalla delatrix.

Penicillaria delatrix, Guénée, Noct. ii. pp. 304, 1112.

Poona.

Plusiidæ.

79. Plusia verticillata.

Plusia verticillata, Guénée, Noct. ii. pp. 344, 1168.

Poona, October ; Bombay, July to November.

80. Plusia signata.
Noctua signata, Fabr. Ent. Syst. iii. 2, pp. 81, 234.
Poona, November.

81. Plusia extrahens.
Plusia extrahens, Walker, xii. p. 929.
Poona, March; Bombay, July.

82. Plusia obtusisigna.
Plusia obtusisigna, Walker, xii. p. 930.
Poona, October.

83. Plusia agramma.
Plusia agramma, Guénée, Noct. iii. pp. 327, 1136.
Bombay, September.

84. Westermannia superba.
Westermannia superba, Hübner, Samml. exot. Schmett. ii. pp. 23, 162, figs. 323, 324.
Poona, October; Bombay, October.

85. Plusiodonta conduceus.
Deva conduceus, Walker, xii. p. 963.
Bombay.

Hyblæidæ.

86. Hyblæa puera.
Phalæna-Noctua puera, Cram. Pap. Exot. ii. p. 10, pl. 103. figs. D, E.
Poona, July and September; Bombay, August and September.
I have a variety taken at Poona in July with a broad grey fascia across the disk, joining a narrower grey fascia from the hinder margin near the base.

Gonopteridæ.

87. Gonitis mesogona.
Gonitis mesogona, Walker, xiii. p. 1002.
Bombay, September.

88. Gonitis involuta.
Gonitis involuta, Walker, xiii. p. 1003.
Bombay, September to December.

89. Gonitis metaxantha.
Gonitis metaxantha, Walker, xiii. p. 1005.
Poona, May.

90. Gonitis albitibia.
Gonitis albitibia, Walker, xiii. p. 1001.
Poona, December.

91. Cosmophila xanthindyma.

♂ *Cosmophila xanthindyma,* Boisd. Faun. Ent. Mad. Bourb. et Maur. Lep. p. 94, pl. 13. fig. 7 (1883).

♀ *Cosmophila indica,* Guénée, Noct. ii. pp. 396, 1256 (1852).

Poona; Bombay, October and November.

Toxocampidæ.

92. Toxocampa moolla, n. sp. (Plate XXVII. fig. 10.)

Poona, October.

Palpi pinkish; antennæ, head, thorax, and fore wings pale pinkish brown; abdomen grey; thorax covered with brown atoms, and with a deep black band in front. Fore wings covered with brown dots, thicker in some parts than in others, forming a short antemedial band, commencing from a deep black longitudinal streak near the hinder border; a postmedial and a discal band, all very diffuse, but plainly visible; on the outside of the discal band is a brown, double, nearly straight line, followed by a row of black spots of various sizes, those in the centre being much the smallest; marginal points black. Hind wings dark smoky grey, with a pale indistinct discal band.

Expanse of wings $1\frac{8}{10}$ inch.

Polydesmidæ.

93. Pandesma quenavadi.

Pandesma quenavadi, Guénée, Noct. ii. pp. 438, 1310.

Bombay, July to November.

94. Pandesma anysa.

Pandesma anysa, Guénée, Noct. ii. pp. 439, 1311.

Cerbia fugitiva, Walker, xiv. p. 1365.

Bombay, August to October.

95. Polydesma boarmoides.

Polydesma boarmoides, Guénée, ii. pp. 441, 1314.

Bombay, September; Poona, May and October.

96. Polydesma brevipalpis.

Alamis brevipalpis, Walker, xiii. p. 1051.

Poona, June and July; Bombay, July.

97. Bamra acronyctoides.

Bamra acronyctoides, Moore, Desc. Lep. Col. Atkinson, p. 160 (1882).

Homopteridæ.

98. Alamis albicincta.

Alamis albicincta, Guénée, Noct. iii. 4, 1322.

Poona, October.

99. Alamis infligens.

Homoptera infligens, Walker, xiii. 1068.

Bombay, December.

100. Panilla dispila.

Homoptera dispila, Walker, xxxiii. 890.

Poona, December.

101. Girpa inangulata.

Hulodes inangulata, Guénée, Noct. iii. 210, 1612.
Remigia optativa, Walker, xiv. 1510.
Remigia optatura, Walker, xv. 1848.

Poona, June and July.

102. Girpa fraterna.

Girpa fraterna, Moore, Lep. Ceylon, iii. p. 94 (1885).

Poona, June and October.

103. Girpa pertendens.

Remigia pertendens, Walker, xiv. 1512.

Poona, October.

Hypogrammidæ.

104. Callyna jugaria.

Callyna jugaria, Walker, xv. 1809.

Poona, July and October.

105. Callyna sidera.

Callyna sidera, Guénée, Noct. i. 113, 178.

Poona, August.

106. Selepa celtis.

Selepa celtis, Moore, Cat. Lep. Mus. E. I. C. ii. 353, pl. ix. *a.* fig. 9.

Poona, November; Bombay.

107. Selepa vitea, n. sp. (Plate XXVII. fig. 17.)

Bombay, October to December; common.

Antennæ grey; palpi, head, and thorax rugose. Wings grey, marked with brown, in some examples with a pinkish tinge: fore wings with the basal half blackish brown, with the outer margin of the black portion edged with pale pinkish white, and with two black lines across the black part, both of them outwardly edged with whitish. The species is very variable. Some specimens have two broad whitish bands across the black half, and others two large whitish patches in it. The second line in the black part runs through the orbicular stigma, and the outer margin of the black part through the reniform, which is large and ear-shaped; the outer half of the wing is clouded with grey, with a submarginal sinuous line. Hind wings grey, unmarked; fringe of both wings pinkish, interrupted with grey.

Expanse of wings $\frac{8}{10}$–1 inch.

108. Selepa occulta, n. sp. (Plate XXVII. fig. 11.)

Poona, June.

Pinkish grey; head with a whitish line on each side above the eyes; thorax and fore wings marked with brown. Fore wings with the reniform stigma round, large, indistinct; orbicular small like a dot, hardly visible; the entire surface of the wing covered with brown streaks and marks, a large white subapical patch margined with brown; marginal line black, with small blackish-brown streaks in the interspaces, a small black basal streak; the hinder margin black at the base and towards the hinder angle, with a blackish streak (sometimes a patch) in the interno-median interspace. Hind wings smoky brown; fringe of both wings pinkish.

Expanse of wings, ♂ $1\frac{1}{10}$ inch, ♀ $1\frac{2}{10}$ inch.

109. Symitha sceptica, n. sp. (Plate XXVII. fig. 6.)

Bombay, July.

Antennæ, palpi, head, thorax, and fore wings grey; thorax with a dark line in front and a deep black central line down the upper half of it. Fore wings covered with dark irrorations, with a deep black short streak near the base; a subcostal black dot near the base, two or three black dots on the disk, some dark grey marks near the apex and near the hinder angle, some submarginal black dots and black marginal points; abdomen and hind wings whitish: hind wings darker towards the costa and outer margin.

Expanse of wings $\frac{8}{10}$ inch.

Catephiidæ.

110. Catephia linteola.

Catephia linteola, Guénée, Noct. iii. 44, 1375.

Bombay.

111. Hypospila bolinoides.

Hypospila bolinoides, Guénée, Noct. iii. 358, 1832.

Bombay.

112. Aucha nectens.

Triphæna nectens, Walker, xv. 1704.

Bombay.

113. Mosara lateralis.

Anophia lateralis, Walker, xxxiii. 917.

Poona, December.

114. ANOPHIA OLIVESCENS.

Anophia olivescens, Guénée, Noct. iii. 48, 1379.

Poona, October; Bombay, October.

A rather variable insect; the white patch on the fore wings is sometimes large, sometimes small, and often absent, and when present its position varies in almost every specimen.

HYPOCALIDÆ.

115. HYPOCALA EFFLORESCENS.

Hypocala efflorescens, Guénée, Noct. iii. 77, 1423.

Bombay.

EREBIIDÆ.

116. NYCTIPAO CREPUSCULARIS.

Phalæna-Attacus crepuscularis, Linn. Syst. Nat. 2811, 13.

Belgaum.

117. ANISONEURA SALEBROSA.

Anisoneura salebrosa, Guénée, Noct. iii. 161, 1552.

Poona.

OMMATOPHORIDÆ.

118. PATULA MACROPS.

Phalæna-Noctua macrops, Linn. Syst. Nat. 225.

Bombay, August to December.

119. ARGIVA HIEROGLYPHICA.

♀ *Phalæna* (*Noctua*) *hieroglyphica*, Drury, Ins. Exot. ii. 3, pl. 2. fig. 1.

♂ *Noctua Ulula*, Fabr. Sp. Ins. ii. 211, 19.

Belgaum; Poona, June, August, and October; Bombay, August to November. Very common in Bombay.

120. ARGIVA CAPRIMULGUS.

Noctua caprimulgus, Fabr. Sp. Ins. ii. 210, 6.

Khandalla, March.

121. SERICIA ANOPS.

Sericia anops, Guénée, Noct. iii. 173, 1564.

Khandalla, April; Belgaum.

122. ENTOMOGRAMMA TORSA.

Entomogramma torsa, Guénée, Noct. iii. 204, 1605.

Poona; Bombay.

123. HOMÆA CLATHRUM.

Homæa clathrum, Walker, xiv. 1334.

Bombay.

124. Speiredonia retrahens.

Speiredonia retrahens, Walker, xiv. 1294.

Poona.

125. Spiramia helicina.

Speiredonia helicina, Hübner, Samml. ex. Schmett. fig. 437.

Belgaum ; Sattara, June and November ; Poona, April, September, and October ; Bombay, August.

126. Hypopyra vespertilio.

Noctua vespertilio, Fabr. Mant. Ins. ii. 136, 16.

Poona, October.

Bendidæ.

127. Hulodes caranea.

Phalæna-Noctua caranea, Cram. Pap. Exot. iii. 140, pl. 269. figs. E, F.

Sattara ; Poona, July ; Bombay, July.

128. Hamodes attacicola.

Ophisma attacicola, Walker, xiv. 1383.

Bombay.

129. Hamodes discistriga.

Hamodes discistriga, Moore, P. Z. S. 1867, p. 78.

Bombay, September.

Ophideridæ.

130. Othreis ancilla.

Phalæna ancilla, Cram. Pap. Exot. ii. 84, pl. 149. fig. F.

Sattara, November ; Poona, July ; Bombay, September and October.

131. Othreis cajeta.

Phalæna-Noctua cajeta, Cram. Pap. Exot. i. 48, pl. 30. fig. A.

Belgaum.

132. Othreis fullonica.

Phalæna-Noctua fullonica, Linn. Syst. Nat. 812, 16.

Bombay, September and October.

133. Rhytia hypermnestra.

Phalæna-Noctua hypermnestra, Cram. Pap. Exot. iv. 69, pl. 323. figs. A, B.

Belgaum ; Poona, November.

134. Argadesa materna.

Phalæna-Noctua materna, Linn. Syst. Nat. ii. 840, 17.

Sattara, November ; Belgaum, September ; Poona, August and October ; Bombay, July and August, October and November.

135. Potamophora manlia.

Phalæna-Noctua manlia, Cram. Pap. Exot. i. 144, pl. 92. fig. A.
Khandalla, December; Bombay, September.

Ophiusidæ.

136. Ophiodes separans.

Ophiodes separans, Walker, xiv. 1357.
Sattara, June; Poona, July; Bombay, July.

137. Ophiodes tumidilinea.

Ophiusa tumidilinea, Walker, xiv. 1433.
Poona, July; Bombay, July to November.

138. Ophiodes triphænoides.

Ophiodes triphænoides, Walker, xiv. 1358.
Khandalla, December; Bombay, January.

139. Lagoptera magica.

Corycia magica, Hübner, Samml. exot. Schmett. iii. 32, 268, f. 535, 536.
Belgaum; Poona, July and August; Bombay, December.
Larvæ feed on *Quisqualis indica.*

140. Lagoptera dotata.

Noctua dotata, Fabr. Ent. Syst. iii. 2, 55, 153.
Khandalla, December; Poona, July; Bombay, August.

141. Sphingomorpha chlorea.

Phalæna chlorea, Cram. Pap. Exot. ii. 12, pl. 104. fig. C.
Poona, June, September, and November.

142. Serrodes inara.

Phalæna inara, Cramer, Pap. Exot. iii. 78, pl. 239. fig. E.
Poona; Bombay.

143. Psimada quadripennis.

Psimada quadripennis, Walker, xv. 1828.
Bombay, October.

144. Achæa mercatoria.

Noctua mercatoria, Fabr. Ent. Syst. iii. 262, 175.
Khandalla, December.
Very common.

145. Achæa combinans.

Achæa combinans, Walker, xiv. 1392.
Bombay.

146. Achæa melicerte.

Phalæna-Noctua melicerte, Drury, Ins. i. 46, pl. 23. fig. 1.

Belgaum; Poona, July, August, and November; Bombay, July to December.

In great plenty in Bombay in July and August. Larvæ feed on *Ricinis communis,* length $2\frac{1}{4}$ inches to $2\frac{1}{2}$ inches; colour varies much, some are deep purplish black, some reddish, some orange-tinted; larval stage 21 to 24 days, pupal stage 18 to 21 days. I successfully reared some in Bombay on wild cucumber leaves, not having any castor-oil plants in my garden.

147. Ercheia cyllota.

Achæa cyllota, Guénée, Noct. iii. 241, 1669.

Bombay, October.

148. Ercheia cyllaria.

Achæa cyllaria, Guénée, Noct. iii. 249, 1670

Bombay, October.

149. Ercheia zura, n. sp.

♂. General colour pale pinkish grey; collar brown on each side; tegulæ whitish. Fore wings with the costal, apical, and outer parts suffused with brown, with some darker marks and with two black streaks near the apex; a deep black stripe extending from the base to the outer margin, at the termination of the second median branch; the whole space below this stripe of a brownish colour; marginal line pale pinkish grey; fringe of the same colour, intercepted with brown and with black streaks opposite the veins; a black dot in the cell. Hind wings blackish, paler towards the base, a white medial band, and a large white submarginal spot at one third from the anal angle; fringe white, intermingled with brown near the centre of the margin. Abdomen grey.

Underside white, with a medial and discal black band across both wings.

Expanse of wings 2 inches.

150. Ercheia zygia, n. sp.

Poona.

♀. General colour pinkish grey, sides of the collar brown, tegula with a thin brown line down its centre; abdomen grey. Fore wings with the upper part of the wings suffused with blackish brown, the suffusion extending downwards to the centre of the interno-median area, outwards to a little beyond the cell, and expands upwards to the apex; a large black spot in the interno-median interspace; two black streaks in the brown part near the apex, and two brown marks near the hinder angle.

Hind wings black, paler towards the abdominal margin, with a slightly interrupted white medial band, a white submarginal spot; abdominal margin white, and two white places on the margin, one under the spot and the other subapical; the corresponding portion of the fringe is also pure white, the rest brown, with a pinkish-white marginal line to that portion of the wing. Underside white, with medial and discal black bands on both wings.

Expanse of wings $2\frac{3}{10}$ inches.

This may be the female of the one preceding; but they were taken more than a hundred miles apart from each other, and have many points of great difference.

151. Ophisma lætabilis.

Ophisma lætabilis, Guénée, Noct. iii. 241, 1657.

Poona, July; Bombay, October.

152. Ophisma maturata.

Ophisma maturata, Walker, xiv. 1382.

Bombay.

153. Ophiusa crameri.

Ophiusa cramerii, Moore, Lep. Ceylon, iii. p. 177 (1885).

Phalæna achatina, Cram. (nec Sulzer), Pap. Exot. iii. 171, pl. 288. fig. A.

Sattara, September; Khandalla, December; Poona, September; Bombay, July and November.

154. Ophiusa olympia, n. sp.

Poona, October; Bombay, July and August.

Very common.

Antennæ and palpi grey, head and throat reddish olive-brown; abdomen paler; fore wings with the inner two thirds dark olive-brown, nearly black, with a medial white band, not so broad as in *O. albovitta*, Guénée, and much narrower in the male than in the female; this band is thinly irrorated with red and black atoms; the outer margin of the black part is white and dentated in three places, this is followed by a pale olive-grey space which is margined by an acutely dentated whitish line commencing at the apex with two black marks and coming straight down to the hinder angle; the space between this line and the outer margin is pale grey; marginal line brown, with black points. Hind wing black with an antemedial white band, and a grey space on the outer margin, cut straight from the black, from near the apex to the anal angle; marginal line black; fringe of both wings interlined, purplish-white, grey, and purplish-white.

Expanse of wings $1\frac{9}{10}$ inch.

155. Ophiusa albivitta.

Ophiusa albivitta, Guénée, Noct. iii. 271, 1707.

Bombay, June and August.

156. Ophiusa conficiens.

Ophiusa conficiens, Walker, xiv. 1432

Bombay.

157. Ophiusa stuposa.

Noctua stuposa, Fabr. Ent. Syst. iii. 2, 42, 112.
Bombay, October.

158. Ophiusa arcuata.

Ophiusa arcuata, Moore, P. Z. S. 1877, p. 609.
Bombay.

159. Ophiusa joviana.

Phalæna-Noctua joviana, Cram. Pap. Exot. iv. 237, pl. 399. f. B.
Poona, July; Bombay.

160. Grammodes ammonia.

Phalæna ammonia, Cram. Pap. Exot. iii. 98, pl. 250. f. D.
Ahmednuggur, October; Bombay, September.

161. Grammodes mygdon.

Phalæna mygdon, Cram. Pap. Exot. ii. 94, pl. 156. f. G.
Bombay, October.

162. Grammodes stolida.

Noctua stolida, Fabr. Sp. Ins. iii. 218, 54.
Bombay.

163. Passipeda satellitia.

Passipeda satellitia, Moore, Lep. Ceylon, iii. p. 184, pl. 171. f. 6 (1885).

Belgaum, September; Poona, October; Bombay, August to November.

Very common.

Euclidiidæ.

164. Trigonodes hyppasia.

Phalæna-Noctua hyppasia, Cram. Pap. Exot. iii. 99, pl. 250. f. E.

Sattara, June; Poona, April to July; Bombay, August to December. Very common.

165. Trigonodes disjuncta.

Trigonodes disjuncta, Moore, Desc. Lep. Col. Atkinson, ii. p. 171 (1882).

Bombay, August.

166. Acantholipes affinis.

Docela affinis, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. v. p. 225 (1880).

Poona, October and November.

REMIGIIDÆ.

167. REMIGIA ARCHESIA.

Phalæna-Noctua archesia, Cram. Pap. Exot. iii. 145, pl. 273. figs. F, G.

Belgaum, September; Poona, August to October; Bombay, September to November. Very common.

168. REMIGIA FRUGALIS.

Noctua frugalis, Fabr. Ent. Syst. iii. 2. 138.

Poona, October, November, and March; Bombay, October, November, and December.

169. REMIGIA QUÆSITA, n. sp. (Plate XXVII. fig. 8.)

Bombay.

♂. Wings narrower than is usual in the genus, outer border oblique; abdomen extending for more than one third beyond the hind wings; antennæ, head, and collar, greyish yellow, thorax and abdomen brown, fore wings reddish brown; a brown diffused streak at end of cell; costa dark brown, a broad brown submarginal band from the costa, near the apex, to the hinder margin, angled inwards in its upper part; the portion of the wing between this band and the outer margin of a dark brownish grey; marginal points black; hind wings cinereous, with a broad blackish marginal band, with a yellowish streak on the margin near the anal angle; fringe of both wings, yellowish, interrupted with brown; underside, wings whitish, with a broad, marginal, blackish, band on both wings, a brown cell-streak on fore wings; body pale yellowish white; legs brown and yellow.

Expanse of wings $1\frac{5}{10}$ inch.

POAPHILIDÆ.

170. POAPHILA SIMPLEX.

Poaphila simplex, Walker, xv. 1840.

Poona, July and December.

THERMESIIDÆ.

171. AZAZIA RUBRICANS.

Ophiusa rubricans, Boisd. Faune Lep. Mad. 106. 11, pl. 16. fig. 1.

Poona, April, July, August, and November; Bombay, September to December.

172. SONAGARA RETICULATA.

Thermesia reticulata, Walker, xxxiii. 1062

Bombay, September and November.

173. SELENIS NIVIAPEX.

Selenis niviapex, Walker, xxxiii. 1069.

Poona, November; Bombay, October.

174. Selenis semilux.

Selenis semilux, Walker, xxxiii. 1069.

Bombay.

175. Mestleta abrupta.

Mestleta abrupta, Walker, xxxiii. 830.

Bombay.

176. Durdara fenestrata.

Durdara fenestrata, Moore, P. Z. S. 1883, p. 27, pl. 6. fig. 6.

Bombay, October.

177. Durdara zonula, n. sp. (Plate XXVIII. fig. 12.)

Bombay.

Brown, suffused with yellowish grey, and here and there with pink; both wings crossed by innumerable dark-brown, very distinct striæ; fore wings with the costa yellowish, a patch of four semidiaphanous spots below the end of the cell, three in a row, and a large one below, with the upper part partly obscured by a yellowish coloration and a brown line, a diffused pinkish patch above these spots; below, the ground-colour of the wings is pale yellowish, with the brown striations standing out very distinctly.

Expanse of wings $\frac{9}{10}$ inch.

178. Gesomia gemma, n. sp.

Poona, September and October. Very plentiful.

Antennæ, palpi, head, and thorax pale reddish yellow; fore wings in some specimens pinkish grey, in some reddish yellow, irrorated with brown atoms, with antemedial, medial, and postmedial sinuous bands, pale reddish brown; reniform represented by a brown dot on a pinkish ground; hind wings pale pinkish testaceous, with a medial pale brown line; fringe of both wings reddish, interrupted with brown.

This insect varies much in colour; some are almost pure chrome-yellow, with the markings very faint, some of them invisible; in others the markings are very distinct; and the brown irrorations cover the outer part of the wing, giving the wing a brown colour, and altogether altering the appearance of the insect.

Expanse of wings $\frac{9}{10}$ inch.

Amphigonidæ.

179. Lacera capella.

Lacera capella, Guénée, Noct. iii. 337, 1802.

Poona; Bombay, October.

180. Amphigonia hepatizans.

Amphigonia hepatizans, Guénée, Noct. iii. 338, 1805.

Bombay, September.

FOCILIIDÆ.

181. MATELLA CADUCA, n. sp. (Plate XXVIII. fig. 9, ♀.)

Poona, July.

Female. Allied to *M. participalis.* Pale dull chrome-yellow; fore part of the thorax slightly reddish; fore wings with the orbicular and reniform marks white, semidiaphanous, thinly outlined with pale brown; the former small, round; the latter larger, elongated and outwardly excavated; lines, brownish, sinuous, an antemedial line on the fore wings, only a postmedial across both wings, also a medial less distinct slightly zigzag line across both wings, passing just in front of the reniform stigma on the fore wing, marginal line slightly waved; underside paler, outer and medial lines well marked, inner line of fore wing absent.

Expanse of wings $1\frac{4}{10}$ inch.

182. DAXATA TANTILLA, n. sp.

Bombay, September.

Above, antennæ, palpi, head, thorax, and all the wings of a dark uniform brown; abdomen slightly paler, both wings crossed by two much sinuated blackish lines, commencing together about the centre of the hinder margin of the fore wings, gradually separating and terminating on the costa of the fore wings, one before and the other beyond the middle; fore wings with another line submarginal, sinuous, and faintly indicated, beyond which the border of the wing is of a paler colour; costa with black and yellow spots; outer marginal lines of both wings black, minutely denticulated, fringe blackish brown, underside whitish.

Expanse of wings $\frac{9}{10}$ inch.

183. RHÆSENA OBLIQUIFASCIATA.

Rhæsena obliquifasciata, Moore, Desc. Lep. Coll. Atk. p. 183.

Poona.

PLATYDIDÆ.

184. EPISPARIS SIGNATA.

Episparis signata, Walker, xxxiii. 1032.

Poona; Bombay, November.

HYPENIDÆ.

185. DICHROMIA OROSIALIS.

Phalæna-Noctua orosia, Cram. Pap. Exot. iii. 149, pl. 275. fig. D.

Dichromia orosialis, Guénée, Delt. et Pyral. 18, 7.

Poona, July.

186. DICHROMIA PULLATA.

Dichromia pullata, Moore, Lep. Ceylon, iii. p. 221.

Bombay, September.

187. Rhynchina pervulgaris, n. sp. (Plate XXVIII. fig. 5.)

Poona, September and October; Bombay, October. Common.

Antennæ, palpi, head, thorax, and fore wings greyish white, marked with greyish brown; fore wings mostly greyish brown with a diffuse whitish streak at the base below the cell, an antemedial, a postmedial, and a submarginal, white sinuous line edged with brown; the second line bent outwardly round the large white reniform stigma, many brown and black atoms here and there on the wing, orbicular, represented in some specimens by a black dot, in some it is obsolete; marginal portion of the wing whitish, marginal line black, slightly sinuous; fringe whitish interrupted with dark grey. Hind wings greyish brown, paler towards the base, fringe whitish. Abdomen whitish with grey bands.

Expanse of wings $\frac{8}{10}$ inch.

188. Hypena laceratalis.

Hypena laceratalis, Walker, xvi. 60.

Poona, October; Bombay, July to December. A very common insect in Bombay.

189. Hypena molpusalis.

Hypena molpusalis, Walker, xix. 844.

Bombay, October.

190. Hypena mimicalis, n. sp. (Plate XXVIII. fig. 6.)

Poona; Bombay, August.

Antennæ, palpi, head, and thorax reddish; abdomen paler; fore wings reddish grey, thickly covered with brown atoms; veins brown, marginal points dark brown; marginal line pale pinkish. Hind wings greyish, sinuous; marginal line pale pinkish; fringe of both wings interlined—grey, pale pinkish, and grey.

Expanse of wings 1 inch.

191. Hypena mandatalis.

Hypena mandatalis, Walker, xvi. 58.

Bombay, July.

192. Hypena obaceralis.

Hypena obaceralis, Walker, xvi. 53.

Bombay, October and November.

193. Hypena iconicalis.

Hypena iconicalis, Walker, xvi. 61.

Bombay, November.

194. Hypena obstupidalis, n. sp. (Plate XXVIII. fig. 7.)

Poona, October.

Allied to *H. ignotalis*, Walker. Of a uniform dark greyish brown. Fore wings with four yellowish-white spots on the costa, near the apex; a black spot in the cell; antemedial, medial, and discal, partly dentated, sinuous, white lines, inwardly margined with brown; marginal line whitish; marginal points lunular, black, marked on the inside with whitish. Hind wings unmarked, marginal line brown. Under side—fore wings smoky grey, with the four costal subapical spots, and with a larger white subcostal spot, near the apex; hinder margin pale grey: hind wings pale grey, with a brown spot at the end of the cell, and with medial and discal brownish thin bands.

Expanse of wings $1\frac{2}{10}$ inch.

195. Hypena speculalis, n. sp. (Plate XXVIII. fig. 8.)

Bombay, October.

Pale greyish red, dotted and striated with brownish; orbicular represented by a minute white dot margined with brown; a black spot on the hinder margin, near the angle; a whitish postmedial straight line, inwardly margined with grey, commencing on the inner side of the spot; marginal points black: hind wings smoky grey, irrorated and striated like the fore wings, with black marginal points; otherwise unmarked.

Expanse of wings $1\frac{2}{10}$ inch.

Closely allied to *H. obaceralis*, Walker.

196. Hypena vecordialis, n. sp. (Plate XXVIII. fig. 10.)

Bombay.

Reddish grey, covered with brown atoms, some brown marks on the costa; a postmedial, perfectly straight, double black line, some black dots on the space between this line and the outer margin; marginal points black: hind wing unmarked; marginal line brown; fringe of both interlined—grey, pinkish white, and grey.

Expanse of wings $1\frac{2}{10}$ inch.

Herminiidæ.

197. Pasira ænigmatica, n. sp. (Plate XXVIII. fig. 11.)

Poona, December; Bombay, September.

Palpi and head reddish; antennæ, thorax, and fore wings brown; abdomen testaceous; thorax with a black band in front. Fore wings with black sinuous lines—one subbasal incomplete, one antemedial upright, and a third, very much curved in the disk, and terminating on the hinder margin on the inner side of a deep black spot on the interno-median interspace, with a black dot on the outer side above it; in some examples there is another black dot on the inner side below it, and in some examples there is also a black spot on the hinder margin near the base.

Hind wings testaceous, paler towards the base; marginal line brown; fringe of both wings reddish. The male has a reddish anal tuft.

Expanse of wings $1\frac{2}{10}$ inch.

198. Pasira russa, n. sp. (Plate XXVIII. fig. 13.)

Poona; Bombay, August, September, and October.

Antennæ, palpi, head, thorax, and fore wings pale yellowish fawn-colour; abdomen whitish testaceous. Thorax with a black line in front. Fore wings with a black spear-shaped mark pointing inwards, on the interno-median interspace, with a black dot on the outside above it; these spots are wanting in some specimens; four brown sinuous lines, the first antemedial, the second medial, almost meeting together on the hinder margin, the second line elbowed outwards, opposite the orbicular stigma, which is represented by a brown dot; third line postmedial, commencing somewhat nearer the second line on the costa, curves widely round the reniform spot, which is small and brown-coloured; this line bends inwardly, with one long tooth, which nearly touches the second line; there is also a submarginal straightish line, which in some specimens is diffused, and in some dotted; marginal points black; fringe yellow.

Hind wings dirty whitish, unmarked.

Expanse of wings $1\frac{2}{10}$ inch.

199. Pasira inscitia, n. sp.

Bombay, July and August.

General colour yellowish fawn-colour. Fore wings with four or five deep black spots, two representing the orbicular and reniform marks, one large one in the interno-median interspace, and one, sometimes two, in a straight line above it; all these spots are very prominent; marginal line brown, slightly dentated. Hind wings with faint medial, discal, and submarginal pale brownish thin bands, marginal line brown, slightly dentated.

Expanse of wings 1 inch.

200. Herminia orthosiana, n. sp. (Plate XXVIII. fig. 15.)

Bombay.

Pale reddish, covered with brown atoms. Fore wings with the reniform stigma represented by a brown dot on a white ground, lines brown, sinuous, upright, antemedial, medial, postmedial, and discal, rather close together, and edged with pale pinkish on the inner sides; marginal points black, with white lunules on the inner side. Hind wings reddish testaceous, with a brown mark at the end of the cell.

Expanse of wings $1\frac{1}{10}$ inch.

201. Herminia velifera, n. sp. (Plate XXVIII. fig. 17.)

Poona, October.

Pale pinkish white, powdered with black atoms and marked and streaked with black. The long palpi are nearly covered with black; thorax with a black band in front, and a black mark in the centre; fore wings covered with black and grey irrorations, thickly in the cell, at the end of which is a black spot; a black streak below from the base, running nearly the whole length of the wing; a black streak on the hinder margin, and between these streaks are other black fainter streaks and lines; there are also some submarginal black streaks; fringe brown. Hind wings pinkish grey, the colour formed by streaks and irrorations, paler in the centre and towards the abdominal margin; fringe white.

Expanse of wings 1 inch.

202. Hipoepa raptatalis.

Hipoepa raptatalis, Walker, xvi. p. 164, ♂.

Poona.

Female. Antennæ, palpi, head, thorax, and fore wings brown, with a slight reddish tinge; abdomen testaceous. Fore wings with a large white, distinct reniform spot; lines brown, sinuous, basal, antemedial, postmedial, and discal; a medial brownish straight band, which touches the reniform on its inner side; marginal points black. Hind wings pale brown, with two faint brown lines, medial and discal; marginal line black; fringe on both wings interlined—pinkish white, brown, pinkish white, and brown.

Expanse of wings $\frac{9}{10}$ inch.

203. Nodaria externalis.

Nodaria externalis. Guén. Delt. p. 64.

Poona, November; Bombay, November and December. Very plentiful. Varies much in size.

204. Catada captiosalis.

Catada captiosalis, Walker, xvi. 210.

Poona; Bombay, October.

205. Labanda pamphosalis.

Bocana pamphosalis, Walker, xix. 887.

Poona, November and December.

206. Aginna circumscripta.

Aginna circumscripta, Walker, xxxiii. 1023.

Poona; Bombay, September, October, and November.

207. Apphadana evulsalis.

Apphadana evulsalis, Walker, xxxiv. 1213.

Bombay, October.

208. Apphadana rusticula, n. sp. (Plate XXVIII. fig. 1.)

Poona, October.

Body and fore wings reddish brown. Head with white lines on each side over the eyes; thorax with a brown mark in front. Fore wings with two brown spots at the base, three brown costal marks at the commencement of the brown lines; lines brown, slightly waved, subbasal, medial, postmedial, and discal, two black marks in the disk, each touching both the postmedial and discal lines; marginal line brown, sinuous; marginal points black. Hind wings brownish testaceous, blackish towards the outer border, with a postmedial, and a faint indication of a discal line; marginal line black; marginal points black: fringe of both wings brown, edged with reddish white.

Expanse of wings 1 inch.

209. Apphadana rubicundula, n. sp. (Plate XXVIII. fig. 2.)

Bombay.

Body brown. Fore wings pale pinkish white, with brown lines and bands, and brown atoms on the clear spaces; a basal and a subbasal upright, sinuous line, the space from the base to the middle of these lines being suffused with brown; a medial diffuse band, with a dentated double line running up it, expanding in the centre, and meeting again on the costa, half the outer dentated line being in the pinkish-white coloured part of the wing; marginal third brown, with a black inner sinuous border; between this border and the medial dentated line is another pale, diffuse, interrupted band; a dark brown zigzag submarginal line, within the brown margin; marginal line brown, sinuous; marginal points black, fringe brown. Hind wings testaceous, with faint brown medial, discal, and submarginal lines; marginal line brown, sinuous; fringe reddish-brown.

Expanse of wings 1 inch.

210. Apphadana festina, n. sp. (Plate XXVIII. fig. 3.)

Bombay.

Antennæ, palpi, head, thorax, and fore wings brown, hind wings and abdomen paler. Fore wings with subbasal, medial, and postmedial sinuous lines, the last two nearly meeting on the hinder margin near the centre, the first and last line edged with whitish inwardly, the middle line edged with whitish outwardly: hind wings with a discal line and a submarginal shade, brownish; marginal points of both wings black; fringe yellowish: underside smoky grey crossed by several darker lines. This insect is very variable, some examples being much paler than others, and some quite reddish with black marks on the costa, the two outer lines composed of dots with two or three black spots.

Expanse of wings 1 inch.

211. Apphadana nigrofusca, n. sp. (Plate XXVIII. fig. 4.)

Poona, October.

General colour of body and both wings slaty-brown; thorax with a brown band in front; abdomen with brown segmental bands. Fore wings with a black mark on the hinder margin, at the base a broad black median band, nearly straight on the inner side, sinuous and toothed, and expanded upwards on the outer side, edged outwardly with whitish; two discal sinuous lines, each edged with whitish on the inner side, marginal points black. Hind wings with a faint medial, and a more distinct discal, blackish line, and a broad blackish marginal band; marginal points black; fringe of both wings brown, with pinkish edges.

Expanse of wings $1\frac{1}{10}$ inch.

212. Spadix vegetus, n. sp. (Plate XXVIII. fig. 14.)

Bombay, September and October.

Antennæ black; palpi, head, and thorax reddish brown. Fore wings with the basal third pale reddish brown, remainder of the wings blackish brown; lines black and sinuous, one basal, the next margining the pale basal part, the third postmedial, inclining towards the second, on the hinder margin; the fourth discal, indistinct, from the hinder angle upright to the costal outer third; the space between the two last lines rather paler than the rest of the black part. Hind wings testaceous. Both wings shining; fringe on both wings pinkish, interrupted with brown.

Expanse of wings $\frac{9}{10}$ inch.

213. Chusaris punctilinealis.

Chusaris punctilinealis, Walker, xxxiv. 1175.

Bombay.

214. Byturna cucullata.

Byturna cucullata, Moore, Lep. Ceylon, iii. p. 254 (1885).

Poona, September and October; Bombay, September and October.

EXPLANATION OF THE PLATES.

Plate XXVII.

Fig. 1. *Leucania polemusa*, n. sp., p. 447.
2. *Discordia evulsa*, n. sp., p. 448.
3. *Ozarba mallarba*, n. sp., p. 452.
4. *Heliothis juncea*, n. sp., p. 448.
5. *Acontia firina*, n. sp., p. 455.
6. *Symitha sceptica*, n. sp., p. 461.
7. *Rhizogramma unilinea*, n. sp., p. 452.
8. *Remigia quæsita*, n. sp., p. 468.
9. *Agrotis vana*, n. sp., p. 453.
10. *Toxocampa moolla*, n. sp., p. 459.
11. *Selepa occulta*, n. sp., p. 461.
12. *Adisura uncta*, n. sp., p. 449.
13. *Acontia quintana*, n. sp., p. 455.
14. *Ozarba itwarra*, n. sp., p. 452.
15. *Acontia pulla*, n. sp., p. 456.
16. —— *opella*, n. sp., p. 456.
17. *Selepa vitea*, n. sp., p. 460.

Plate XXVIII.

Fig. 1. *Apphadana rusticula*, n. sp., p. 474.
2. —— *rubicundula*, n. sp., p. 475.
3. —— *festina*, n. sp, p. 475.
4. —— *nigrofusca*, n. sp., p. 475.
5. *Rhynchina pervulgaris*, n. sp., p. 471.
6. *Hypena mimicalis*, n. sp., p. 471.
7. —— *obstupidalis*, n. sp., p. 471.
8. —— *speculalis*, n. sp., p. 472.
9. *Matella caduca*, ♀, n. sp, p. 470.
10. *Hypena vecordialis*, n. sp., p. 472.
11. *Pasira ænigmatica*, n. sp., p. 472.
12. *Durdara zonula*, n. sp., p. 469.
13. *Pasira russa*, n. sp., p. 472.
14. *Spadix vegetus*, n. sp., p. 475.
15. *Herminia orthosiana*, n. sp., p. 473.
16. *Marimatha pura*, n. sp., p. 456.
17. *Herminia velifera*, n. sp., p. 473.

6. Note on *Viverricula*. By St. G. Mivart, F.R.S.

[Received April 29, 1885.]

In 1882 I stated before this Society (see P. Z. S. 1882, p. 149) that *Viverricula* was distinguished from *Viverra* by having (amongst other characters) "a very small bald spot on the tibial side of the plantar pad." I am indebted to the kindness of Mr. Blanford, F.R.S., for calling my attention to the fact that this spot is really the homologue of the hallucal pad of *Viverra*, and I am therefore anxious to rectify the above-cited assertion.

There is indeed a striking difference between the feet of *Viverra* and *Viverricula*, as the much greater remoteness of this small hallucal spot from the large plantar pad causes the bald spot to be much more conspicuous in the latter genus, but its distinctness consists in its being more obvious and is not a distinctness of homology.

7. On the Right Cardiac Valve of the Specimens of *Apteryx* dissected by Sir Richard Owen in 1841. By E. Ray Lankester, M.A., F.R.S.

[Received April 25, 1885.]

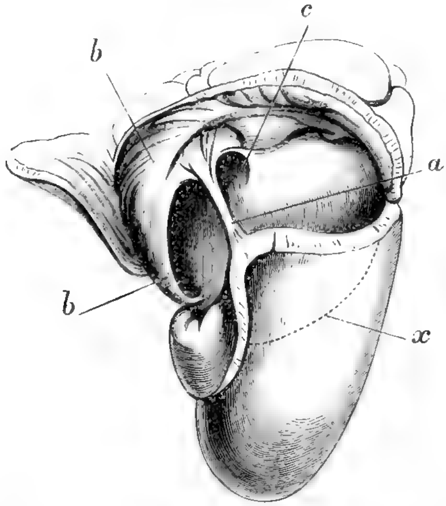
In a former communication[1] I showed that it was highly probable that the heart figured and described by Sir R. Owen in 1842, in the 'Transactions' of the Society, as the heart of an Apteryx was in reality the heart of an Ornithorhynchus. I based this opinion on the facts :—1. That the structure of the right cardiac valve as described and figured by Sir Richard more nearly resembled that of *Ornithorhynchus* than that of any other animal. 2. That in two hearts of *Apteryx* examined by Mr. Beddard and in one examined by myself, the structure of the right cardiac valve was precisely similar to that of an ordinary bird, and differed altogether from Sir Richard Owen's description and figure. 3. That in the College of Surgeons Museum there was a heart of *Ornithorhynchus* with the right cardiac valve displayed much as in Sir Richard Owen's figure of a supposed *Apteryx*-heart, and that on this preparation was painted the name *Apteryx australis*. 4. That this heart—actually of *Ornithorhynchus* but labelled "*Apteryx*"—was entered in the Catalogue as the heart of *Apteryx australis*, the entry having been made apparently at a date corresponding to the time when Sir Richard was Hunterian Curator.

Sir Richard Owen has since communicated to the Society a note, in which he expresses himself as unable to accept the explanation which I have suggested of the fact that the right cardiac valve of *Apteryx* as described by him differs so completely from that structure as seen by Mr. Beddard[2] and myself in other specimens. He

[1] P. Z. S. 1885, p. 239. [2] *Cf.* P. Z. S. 1885, p. 188.

states that he dissected at the period in question (more than forty years ago) three specimens of *Apteryx*; and if I understand him

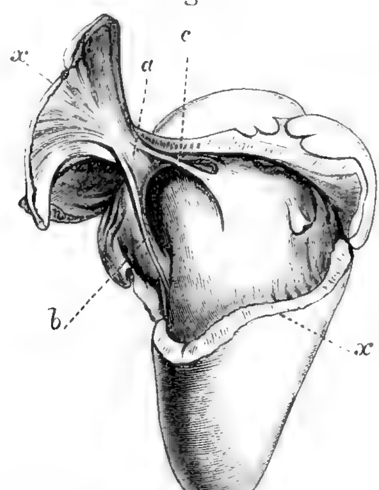
Fig. 1.



Heart of the Common Fowl (*Gallus domesticus*).

The right ventricle is opened by a nearly horizontal cut which runs above (*i. e.* nearer the auriculo-ventricular ring than) the insertion of the muscular band (=musculus papillaris) into the free wall of the ventricle. The dotted line *x* indicates the course of a subsequently effected cut which set free the part of the ventricular wall into which the muscular band is inserted, and allowed the band to be reflected, as shown in fig. 2.

Fig. 2.

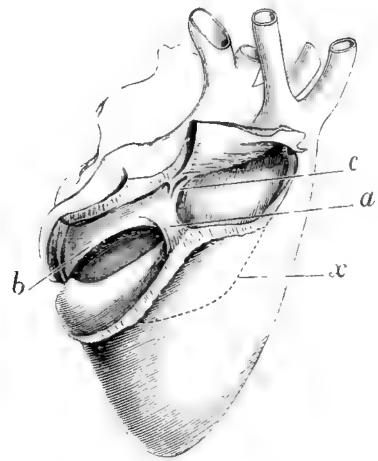


The same heart as that drawn in fig. 1; the cut *x* having now been made, and the ventricular wall with the attached muscular band *a* reflected.

aright, he is inclined to believe that no mistake occurred in connection with his drawings or preparations, and that the hearts of his three specimens did actually present the characters of structure in the right cardiac valve which he described and figured.

Fortunately Sir Richard Owen's specimens of *Apteryx* are still in

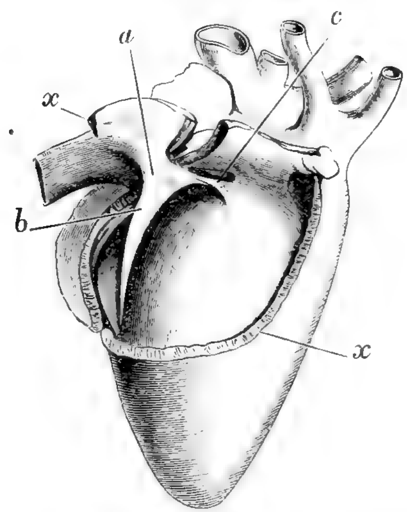
Fig. 3.



Heart of *Apteryx australis*, Ow., with the right ventricle opened as in the Common Fowl's heart drawn in fig. 1.

The muscular band *a* has the same relations as in fig. 1, but is shorter and broader, owing to the contraction of the specimen in alcohol. The dotted line *x* indicates the course of the cut which was subsequently made and allowed the reflection of the ventricular wall, as shown in fig. 4.

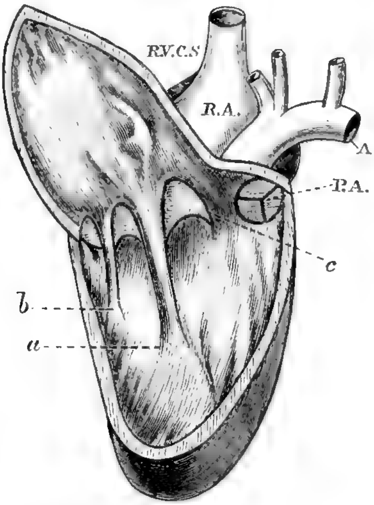
Fig. 4.



The same heart as that drawn in fig. 3. The cut along the dotted line *x* of fig. 3 has been effected, and the ventricular wall with the attachment of the muscular valve reflected.

existence, and have been exhumed by Dr. Garson from among the stores of the Museum of the Royal College of Surgeons. Dr.

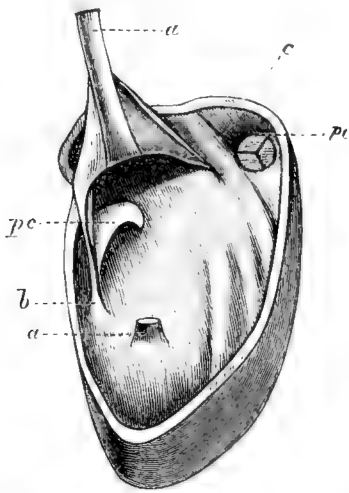
Fig. 5.



Heart of *Ornithorhynchus.*

The right ventricle opened so as to expose the right cardiac valve. There is no connection here of the great anterior muscular band (a) of the valve with the free wall of the ventricle. It arises entirely from the septal wall. The distinction is not a fundamental one; the muscular band a in figs. 5 and 6 is to be identified with the muscular band a of the Birds' hearts (figs. 1 to 4). Similarly the much shorter muscular band or fold c in the Birds' hearts appears to be the same structure as the band marked c in the present figure of the right cardiac valve of *Ornithorhynchus.*

Fig. 6.



The same heart as that drawn in fig. 5, with the great anterior muscular band (a) cut through, so as to allow the valve to be reflected, for comparison with the similar views of the heart of the Fowl, fig. 2, and the heart of *Apteryx*, fig. 4.

Letters in all the figures.

a. The large anterior muscular band passing from the free margin of the valvular flap to the ventricular wall (this is the great anterior musculus papillaris of Mammals). b. The muscular flap of the Birds' valve. c. The small left muscular band of attachment from the valve to the ventricular wall (left or "conus" musculus papillaris of the Mammal).

Garson has written me as follows in regard to these specimens, and has very kindly afforded me an opportunity of examining them. The result is conclusive, since I am now able to show what is the condition of the right cardiac valve in the actual specimens *dissected* by Sir Richard Owen, having previously shown what was the origin of the heart *figured* by him.

Dr. Garson writes :—

"Royal College of Surgeons of England,
April 23, 1885.

"Dear Prof. Lankester,

"I forward you a specimen of *Apteryx* partially dissected by Prof. Owen, in which the heart is *in situ* but opened into, and I also send another specimen of *Apteryx*-heart taken from a bottle in which are preserved the viscera and other parts of an *Apteryx* dissected by Prof. Owen, and which he had treated with acid so as to soften the bones. The auricle of this second specimen is opened. We have a third specimen of *Apteryx* partly dissected, in which the heart is untouched, and so cannot have been used for the drawing showing the interior.

"I do not think the illustration is taken from either of the specimens I send you; consequently if Sir Richard Owen says he had only three specimens of the bird, there is conclusive proof that the heart of some other animal has been figured for *Apteryx*.

"I should be greatly obliged if you would kindly let us have back the specimens as soon as you have finished with them,

Believe me,
Yours very truly,
J. G. Garson."

The specimens forwarded by Dr. Garson were examined by me in the presence of Assistant-Professor Bourne, of University College. In the first (that *in situ* in a dissected Apteryx) the left ventricle had been horizontally cut, and an oblique cut had been effected in the extreme left region of the right ventricular wall. But this cut was not such as to render the right cardiac valve visible, still less would it have been possible to make, from this specimen, the figure published by Sir Richard in 1842.

Similarly impossible was it for any information with regard to the right cardiac valve to have been derived from the second specimen, since the wall of the ventricle was uncut.

Since the third specimen of *Apteryx*-heart in the College of Surgeons store-collection is unopened in any way, we may accept Dr. Garson's conclusion that the drawing published by Sir Richard Owen in 1842 was not made from any one of these specimens; and since they are the three specimens of *Apteryx* which were at Sir Richard's disposal, and seeing that according to his statement he had no other specimens of the Apteryx, the drawing in question cannot have been taken from an *Apteryx*-heart.

Lastly, I have had the interesting opportunity of seeing *what actually is* the condition of the right cardiac valve in two out of three of Sir Richard's original specimens. The third specimen, which has never been opened, is still available in case of a final appeal. I would suggest that if there is any one still in doubt on the subject, any one who still thinks that the right cardiac valve of *Apteryx* differs from that of ordinary birds and is provided with chordæ tendineæ attached to membranous flaps, he should be asked to open Sir Richard Owen's hitherto unpenetrated third specimen at a meeting of this Society.

The first and the second specimens I have opened by an appropriate incision in the right ventricular wall, in the presence of Professor Bourne, and had no difficulty in bringing the right cardiac valve in each heart into full view. It presented none of the peculiar features attributed by Sir Richard Owen to the right cardiac valve of these identical specimens which Sir Richard believes himself to have examined, but which neither he nor any one else had seen until I opened up the ventricular wall to-day (April 24th, 1885). The valve was entirely fleshy as in an ordinary bird (compare figs. 1, 2, with figs. 3, 4). There were no radiating fibrous cords binding the mid-region of the valve to the ventricular wall, such as are shown in Sir Richard Owen's drawing. There was no departure from the typical Avian right cardiac valve; no such departure has been seen in any specimen of the *Apteryx*-heart which has been *opened.*

It seems important that the actual condition of the right cardiac valve in *Apteryx* should be represented pictorially, and I therefore give here two drawings of that structure taken from the specimen in my possession (figs. 3 & 4, p. 479), and also for comparison, two views of the right cardiac valve of the Common Fowl (figs. 1 & 2, p. 478), and of the *Ornithorhynchus* (figs. 5 & 6, p. 480) for comparison.

May 19, 1885.

F. Du Cane Godman, Esq., F.R.S., F.Z.S., in the Chair.

A communication was read from Prof. J. von Haast, C.M.Z.S., containing a description of some fossil remains of a species of *Dinornis* remarkable for its small size, and apparently previously undescribed, which he proposed to call *Dinornis oweni.* The remains in question, at present deposited in the Auckland Museum, had been obtained near Whangarei, New Zealand. Prof. von Haast added some remarks on *Dinornis crassus,* Owen.

This paper will be printed entire in the Society's 'Transactions.'

The Secretary read the following extract from a letter addressed to him by the Rev. G. H. R. Fisk, C.M.Z.S., dated Breakwater, Cape Town, January 27th, 1885:—

"I wish to mention that a Snake was taken amongst the rocks in a pool of water and seaweed at the entrance to Table Bay, which, from the description given of it by those who found it, I have every reason to believe was a '*Pelamis bicolor.*' It was found by the very intelligent children of Mr. John Saunders, Secretary to the Table Bay Harbour Board, and was seen by Mr. Saunders and others.

"Unfortunately it was not sent to me, but was killed, and thrown back into the sea. I think that I mentioned in a former letter that a very fine specimen of this Snake, taken in False Bay near Muizenburg and sent to me dead, is now in the South African Museum. Perhaps it is worthy of remark that this Snake, if I am correct as to its identity, having been found in Table Bay, had reached the Atlantic."

A letter was read from Mr. B. Crowther, of Launceston, Tasmania, stating that he had in captivity some living examples of the Duckbill (*Ornithorhynchus paradoxus*), which he was proposing to send home as a present to the Society's Menagerie. Details were added as to the best mode of keeping and feeding these animals in confinement.

Mr. Osbert H. Howarth exhibited and made remarks on a specimen of Coral of the genus *Dendrophyllia*, attached to a stoneware bottle which had been dredged up in the Atlantic off Madeira at a depth of from 15–20 fathoms. The coral, when brought to the surface, was of a brilliant orange colour, and the tentacles of the animal were hanging from each branch.

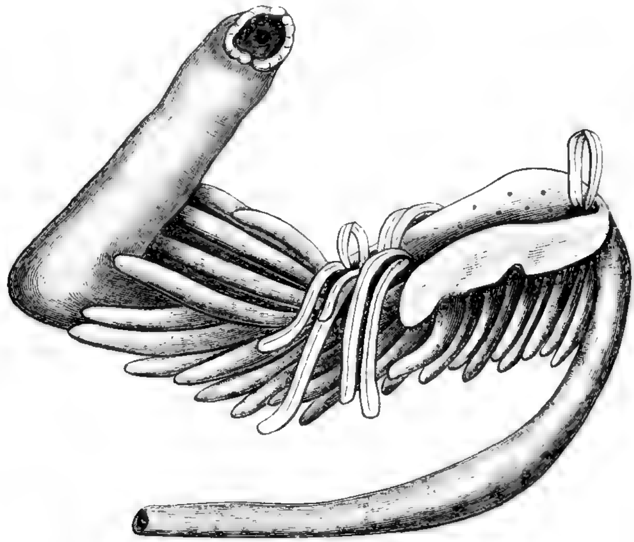
Mr. Howarth also exhibited and drew attention to the large number of shells found inside the bottle.

Mr. F. Day exhibited a specimen of the Vendace (*Coregonus vandesius*), which, he observed, was one of three (received from Mr. W. Kimsey Dover) that had been taken in Derwentwater and Bassenthwaite lakes, where Dr. Davy had recorded their occurrence in 1858, but whose statement has been generally overlooked. The Gwiniad (*C. coregonoides*) would seem to be restricted in the Lake district to Haweswater and the lake-system that joins the Eden.

Mr. Day also exhibited the diseased intestine of a Sea-Trout, which fish had been taken with the fly by Mr. A. Caldwell in the Esk on May 1st. It was $\frac{1}{4}$ lb. in weight and in excellent condition, but when landed its abdomen was observed to be "swollen as if it had a stone inside." On being opened, the commencement of the small intestine was seen to be as represented in the accompanying figure (p. 484). A slit $\frac{4}{5}$ of an inch long existed along it, and the edges were everted, occasioning this spot to be like an open ditch with an orifice at the commencement, and its termination leading into the intestinal canal. Either opening was almost choked up by worms (*Bothriocephalus*), but it was found that the intestines below the seat of injury contained undigested food similar to what was in the stomach above it. There was no adhesion between the intestine and the abdominal walls;

which, however, must have acted so as to prevent the escape of food into the abdominal cavity.

Mr. Day likewise exhibited a portion of the sifting-apparatus of the Basking Shark (*Selache maxima*) which had been captured off Deadmans on May 6th. These branchial combs or teeth had been



Intestines of diseased Trout.

fully described by Prof. Turner. The food taken from the Shark's stomach was exhibited, and had the appearance of "red stuff like bruised crabs, or the roe of the Sea-Urchin, as described by Low," and in the pharynx were quantities of sessile-eyed crustaceans, mostly Amphipoda and Copepoda in a fresh condition, and evidently what the substance in the stomach originally consisted of, as was further proved by a microscopic examination. The specimen was a female over eleven feet long, and the longest tooth in its jaws was 0·09 of an inch.

The following papers were read:—

1. Notes on the Pinnipedia. By St. George Mivart, V.P.Z.S.

[Received April 16, 1885.]

To the question whether or not the group of Pinnipeds should form a distinct order of Mammalia, modern science adds that concerning their genetic affinities. This latter inquiry suggests another question, namely, the question whether the group is genetically homogeneous, or whether it may have had more than one source. If the latter question can be settled, it then remains but to inquire from what source or sources the whole group was derived.

That the group is subdivisible into three main subgroups has been long recognized.

Mr. H. N. Turner, in his classical paper on the foramina of the Base of the Skull [1], gives to the group the value of a family, *Phocidæ*, which he subdivides and characterizes as follow [2]:—

Fam. PHOCIDÆ.

Molars all similar in structure.

Subfamily ARCTOCEPHALINA.

A postorbital process. An alisphenoid canal; mastoid process strong and salient, standing aloof from the auditory bulla.

Otaria. *Arctocephalus.*

Subfam. TRICHECHINA.

No postorbital process. A distinct alisphenoid canal. Mastoid process strong and salient, its surface continuous with the auditory bulla.

Trichechus.

Subfam. PHOCINA.

No postorbital process. No alisphenoid canal. Mastoid process swollen and seeming to form part of the auditory bulla.

Morunga.	*Lobodon.*
Cystophora.	*Leptonyx.*
Halichœrus.	*Stenorhynchus.*
Ommatophoca.	*Phoca.*

Professor Flower, in his paper on the Classification of the Carnivora [3], says:—"With regard to the group of Seals, which I look upon as essentially belonging to the same ordinal division of the Mammalia as the animals hitherto treated of [*i. e.* the fissipedal Carnivora], the differences of the cranial characters of the three natural families into which they are divisible, the *Otariidæ, Trichechidæ,* and *Phocidæ,* are so well described by Mr. Turner that I need only refer to his paper for them. But I must add that I cannot agree with him when he says, 'I have not seen in the Seals anything which, in my opinion, warrants their approximation to any of the other families more than another,' or in his placing them and the three divisions of the terrestrial Carnivora as primary groups of equal value. The differences between the Seals and the terrestrial Carnivora both in teeth and limbs are much greater than any found between different members of the latter group. They should therefore constitute, in my opinion, a

[1] P. Z. S. 1848, p. 63. [2] *L. c.* p. 88. [3] See P. Z. S. 1869, p. 34.

distinct suborder, the Æluroid, Cynoid, and Arctoid Carnivora being united to form the other suborder. I think moreover that there is not the slightest question that their cranial characters indicate most strongly their approximation to the Arctoid type, as has often been noticed before on other grounds (De Blainville says, 'Les Ours, dont les rapports avec les Phoques ont été sentis de tout temps et même par Aristote,' Ostéographie, tome ii. p. 49). Indeed their skulls seem to be simply a further modification of this type, showing resemblances to the true Bears on the one hand, and the Otters on the other."

Before stating my own general conclusions, I will proceed to give my notes upon the various genera of Pinnipeds.

Phoca[1].—This genus consists of half-a-dozen or a few more species, confined to the northern arctic and temperate regions of the Old and New Worlds, including the Aral and Caspian Seas and the coasts of Japan. *P. vitulina* is found in both hemispheres. They have the palms and soles hairy, five well-developed claws to each foot, those of the manus being the broader and more curved. The hind limbs are constantly extended backwards, and cannot be turned forwards. There is no external ear and no scrotum. The toes of the pes do not differ quietly in length, the first and fifth not greatly exceeding the others. There are 14 or 15 dorsal, 5 lumbar, 4 sacral, and from 11 to 15 caudal vertebræ.

The skull presents the following general characters:—

The premaxilla is much separated from the frontal by a more or less wide junction of the nasal with the maxilla. The nasals are not generally, if at all, anchylosed together, and they join the premaxillæ. There is no lachrymal foramen. The infraorbital foramen is of moderate size, or rather large. There is no distinct foramen rotundum, one opening representing both it and the spheno-orbital fissure. Sometimes there are defects of ossification between the basisphenoid, alisphenoid, and pterygoid. There are one or two large openings in the palatine, representing the spheno-palatine foramen, with defects of ossification above it between the frontal, maxilla, and palatine. There are also, generally, defects of ossification in the basisphenoid and basioccipital. The alisphenoid is joined by a long descending process of the parietal. There is no postorbital process from the frontal, and the zygomatic postorbital process is formed partly by the malar and partly by the squamosal. There is a large crista galli. The cerebellar fossa of the petrosal is very deep. The bulla is dense and undivided, traversed by a carotid canal the posterior aperture of which is on the hinder surface of the bulla. There is, in most cases, hardly any paroccipital process. The mastoid is prominent and forms an outwardly directed

[1] Linn. Fn. Suec. ii. p. 2, 4; Syst. Nat. 12, i. p. 56; Schreb. Säug. vol. vii. p. 17; Buffon, Hist. Nat. xiii. p. 333, pl. 45, and Suppl. vi. pl. 46; Gray (*Callocephalus*, *Pagomys*, *Pagophilus*, *Halicyon*, and *Phoca*), Catalogue of Seals and Whales in Brit. Mus. pp. 20–32; J. J. Allen, North Amer. Pinnipeds, pp. 412, 557, &c.; De Blainville, Ostéog., *Phoca*; Cuvier, Ossem. Foss., Atlas, vol. ii. pl. 219.

process, behind which the bone is rounded. The stylomastoid foramen lies in a deep groove which divides the mastoid from the bulla. The meatus auditorius externus is produced outwards, but its lower lip inclines so much upwards posteriorly that the aperture is made to look more forwards than upwards, and the outer end of the lip may be produced a little forwards in front of the aperture. There is a postglenoid foramen. The posterior palatine foramina are situated behind the middle of the palate. The pterygoid has a distinct hamular process. The basis cranii has a surface bent convex downwards between the occipital foramen and the presphenoid. Venous canals traverse the inside of the exoccipitals and open on the inner side of either occipital condyle. The mandible has a distinct subangular process, and the angle is pressed up very near the condyle. The symphysis may be long or short.

Dentition:—I. $\frac{3}{2}$, C. $\frac{1}{1}$, P. $\frac{4}{4}$, M. $\frac{1}{1}=34$.

Molars, except the first, with two roots. Each upper molar has a principal cusp with one or two accessory cusps behind, and sometimes one in front of it. The lower molars have each a principal cusp with one, sometimes two, accessory cusps in front of it, and generally two behind it.

In *P. vitulina* the hinder margin of the palate is V-shaped, the apex being forwards. The suture between the palatines and maxillæ forms a straight transverse line. The teeth are rather large and multicuspidate.

In *P. grœnlandica* the palate has a straight, transverse, hinder margin. There is sometimes a distinct pterygoid fossa. The paroccipital process may form a marked, nipple-like projection. The teeth are more simple than in *P. vitulina.*

In *P. barbata* the maxilla has a swollen outer surface; venous canals open inside the upper margin of the foramen magnum, and a curious ridge runs downwards and forwards across the squamosal and parallel with the hinder root of the zygoma. The meatus auditorius externus looks mainly upwards. The paroccipital process is rather prominent. The palate extends far back, and has an evenly concave hinder margin. The two parietals form a small wedge-shaped process which advances between the hinder margins of the two frontals.

Halichœrus [1].—This genus contains but one species, *H. gryphus*, which inhabits the coasts of Scandinavia and the British Isles. Its palms and soles are hairy, and it has five well-developed claws on each foot, those of the manus being the broader and more curved. There are 15 dorsal, 5 lumbar, 4 sacral, and about 14 caudal vertebræ.

In the skull the same characters are found as those already attributed to *Phoca*, except that there is a more decided defect of ossification between the ali- and basisphenoids and the pterygoid. Moreover the palatine foramina are much behind the middle of the palate.

[1] Fabric. Skrivt. af Naturh. Selsk. i. p. 167, tab. 13. fig. 4; Nilsson, Vet. Akad. Handl. p. 377, tab. 34. figs. 1 & 2; Bell, Brit. Quad. p. 278; Gray, Cat. Brit. Mus. p. 33; Schreber, Fortgesetzt Wagner, vii. p. 12; De Blainville, Ostéogr. *Phoca*; Allen, North Amer. Pinn. p. 682.

It is noteworthy that the mastoid process is not so large relatively in certain old individuals as in younger ones. The palate has a concave hinder margin. The anterior nares are very high.

Dentition :—I. $\frac{3}{2}$, C. $\frac{1}{1}$, P. $\frac{4}{4}$, M. $\frac{1}{1}$=34.

Molars large, conical and simple, generally without accessory cusps. Their apices are slightly recurved, and the anterior and posterior edge of each is rather sharp. All have but a single root, save the true molars and the fourth upper premolar. It is only these three teeth which ever have accessory cusps.

Stenorhynchus[1].—This genus consists of two species, confined to the Antarctic and Southern oceans. The hind feet are almost or quite clawless, and the first and fifth toes greatly exceed the others in length. There are 14 or 15 dorsal, 6 or 5 lumbar, 3 sacral, and 12 or 14 caudal vertebræ.

The skull presents the characters already enumerated as occurring in *Phoca*, except that the premaxillæ do not attain, or hardly attain, the nasals, which are more or less completely anchylosed together. There may be but very small defects of ossification in the occipital. The long descending process of the parietal hardly attains the alisphenoid. The cerebellar fossa of the petrosal is small. There is a moderate paroccipital process. The optic foramina may (they do in *S. leptonyx*) unite inwards to open into the cranial cavity by a single and median aperture. The hamular processes of the pterygoids may be long, as in *S. carcinophagus*, or hardly any, as in *S. leptonyx*. The bulla may not be so prominent as in *Phoca*. The glenoid foramen is in the form of a small fissure, placed rather on the inner side of the postglenoid process. There is a large preorbital process on the maxilla, a structure which is only represented by a rudiment in *Phoca* and *Halichœrus*, so far as I have seen[2]. The palate is strongly notched behind medianly. There is no subangular process to the mandible, and the angle may be almost obsolete, though marked in *S. carcinophagus*, while the coronoid process is lower than in *Phoca* and *Halichœrus*.

Dentition :—I. $\frac{2}{2}$, C. $\frac{1}{1}$, P. $\frac{4}{4}$, M. $\frac{1}{1}$.

The molars (which are, except the first, two-rooted) may, as in *S. leptonyx*, have three pointed cusps well separated, the middle being the largest and slightly recurved towards the apex, the apices of the other two being inclined towards the long cusp, or else, as in *S. carcinophagus*, they may have subcompressed, much elongated crowns with a principal recurved cusp with a small one in front of it, and one, two, or three accessory cusps behind it, the principal cusp being somewhat bulbous at the apex.

[1] Gray, Voy. of Erebus & Terror, Mam. i. p. 2, pls. 1 & 2; Cat. Brit. Mus. p. 15; De Blainville, Ostéographie; Schreber, Fortg. Wagner, vii. pp. 36–38; Cuvier, Oss. Foss. Atlas, vol. ii. pl. 219. fig. 2. This is the *Ogmorhinus* of Peters, Monatsbr. K. P. Akad. Wissen. Berlin, 1875, p. 393, note; Allen, N. Am. Pinniped. p. 466. It is also the *Lobodon* of Gray, Voy. of Erebus & Terror, and Catalog. Brit. Mus. p. 8, and of Allen, N. Amer. Pinnipeds. p. 466.

[2] A rudiment of this process is also found in *Lutra* and *Ursus*, but in no other land Carnivora, so far as I have observed.

Leptonyx[1].—A genus of one species inhabiting the Antarctic seas. Its hind feet have rudimentary claws, with the first and fifth toes much longer than the others.

The skull generally resembles that of *Phoca*. The premaxillæ are widely separated from the frontals, but just attain the nasals, which are anchylosed together and prolonged backwards as a slender process between the two frontals. The infraorbital foramen is of moderate size. There are defects of ossification in the basi- and exoccipitals and between the basioccipital and basisphenoid; also between the frontal, maxilla, and palatine, and a very large single sphenopalatine foramen. The anterior nares are neither very wide nor extending far backwards. The alisphenoids and parietals have a rather wide junction. There is a very small true paroccipital process just behind the foramen lacerum posterius, but besides this a vertical ridge juts outwards near the margin of the exoccipital, where it joins the mastoid. The postglenoid foramen is minute, but the condyloid foramen is conspicuous. The palatine foramina open about the antero-posterior middle of the palate. The pterygoid has an outwardly tending hamular process. The basis cranii is convex below as in *Phoca*. The maxilla develops no preorbital process. The posterior margin of the palate is concave. The mandible is slender, and has no subangular process, but the coronoid rises decidedly above the condyle. The symphysis is rather long.

Dentition:—I. $\frac{2}{2}$, C. $\frac{1}{1}$, P. $\frac{4}{4}$, M. $\frac{1}{1}=32$.

The molars are small, each with a large conical cusp proceeding from a cingulum. There are no distinctly developed accessory cusps except in the last, or last two, lower molars, but there is a constant tendency to develop an accessory cusp in front of and behind the principal cusp.

Ommatophoca[2].—This genus contains one species, which inhabits the Antarctic Seas. Here the hind feet are devoid of claws, and the first and fifth toes are much longer than the others. The claws on the fore feet are quite rudimentary.

In the skull we here find premaxillæ which do not attain the nasals, so that the maxillæ help to bound the anterior nares. The nasals are completely anchylosed together, and form a very long isosceles triangle, the long angle being wedged in between the frontals, while anteriorly the maxillæ join the nasals. The orbits are immense, and give a very distinctive appearance to the skull, and the zygomata are strongly develcped and much arched downwards. The infraorbital foramen is rather small. The condyloid foramen is conspicuous. The lower postorbital process is formed by both the malar and squamosal, as in all the genera hitherto noticed. In

[1] *Phoca leopardina*, Jameson Weddell, Voy. South Pole, i. pp. 22, 24, 134.
Stenorhynchus Weddelli, Lesson, Mam. 1827, p. 200.
Leptonyx Weddellii, Schreber, Fortg. Wagner, vii. p 39; Gray, Cat. Brit. Mus. p. 11, Erebus & Terror, pl. 5.
Leptonychotes Weddelli, Allen, N. Amer. Pinniped. p. 467.

[2] Gray, Zool. Erebus and Terror, Mamm.; Cat. Seals Brit. Mus. p. 13; Schreber's Fortgesetzt Wagner, vii. p. 40; Allen, N. Amer. Pinnipeds, p. 467.

addition to this, however, there is a faint trace of a frontal post-orbital process. The anterior nares do not extend far backwards. The palate is prolonged backwards behind the last molars, and its hinder margin is slightly concave. The palatine foramina open on its hinder half. There is hardly any true paroccipital process, but, as in the last-noticed genus, a vertical ridge near it projects backwards and away from the bulla. The mastoid is prominent, and its prominence is continuous with that of the squamosal above the external auditory meatus, immediately above which opening is a great antero-posteriorly extending bony swollen prominence. The meatus opens between the outwardly projecting mastoid and the postglenoid process, so that practically its lateral walls, but not its floor, are prolonged outwards. There is a chink-like postglenoid foramen. The basis cranii is always level, but slightly convex antero-posteriorly. The mandible has no subangular process, but in the place where it should be the bone is rounded. The coronoid is pointed, but small and low, hardly rising above the condyle. The maxilla develops a preorbital process. The symphysis is not prolonged.

Dentition:—I. $\frac{2}{2}$, C. $\frac{1}{1}$, P. $\frac{4}{4}$, M. $\frac{1}{1}$=32.

The molars are very small, and have pointed, recurved crowns, mostly with a marked posterior accessory cusp and sometimes with one in front also.

Monachus [1].—This genus, of one species from the Mediterranean and Black Seas and the Atlantic Ocean about Madeira and the Canary Isles, resembles the three preceding genera in having the nails of the hind feet rudimentary, and the first and fifth toes greatly longer than the others. The nails on the fore feet are also rudimentary in this genus.

There are 15 dorsal, 5 lumbar, 2 sacral, and 11 caudal vertebræ.

The skull in its main characters resembles that of *Phoca*. The crista galli and cerebellar fossa of the petrosal are rather larger. The condyloid foramen is distinct, and placed midway between the condyle and the foramen lacerum posterius. There is a distinct preorbital process on the front rim of the orbit and developed from the maxilla. The nasals are not anchylosed together, and the premaxillæ ascend to meet them. The palate is concave behind, and its concave border is medianly notched. I have observed no defects of ossification in the basi- or exoccipitals, but (as in *P. barbata*) a venous channel traverses the supraoccipital opening by transverse apertures above the foramen magnum and inside its margin. There is a very large aperture on either side of the basis cranii bounded by

[1] *Phoca monachus*, Hermann, Beschäft. d. Berlin. Gesell. natur. Freunde, iv. 1779, p. 456, pl. 12, 13.
Phoque à ventre blanc, Buffon, Hist. Nat. Supp. vi. pl. 44; Cuvier, Oss. Foss. Atlas, vol. ii. pl. 218.
Monachus mediterraneus, Nilsson, Kong. Vet.-Akad. Handl. Stockholm (1837), p. 235.
Leptonyx monachus, Schreber's Fortg. Wagner, vii. p. 40.
Monachus albiventer, Gray, Cat. Seals Brit. Mus. (1866) p. 17; Allen, N. Amer. Pinnipeds, p. 465.

the pterygoid, palatine, presphenoid, and basisphenoid. There is a large paroccipital process and a considerable mastoid process. The meatus auditorius externus is prolonged well outwards, its lip is completed in front. The considerable palatine foramina are placed at about the antero-posterior middle of the palate. There is no angular process of the mandible near the condyle, but only a single process, which seems to correspond with the subangular process of those Seals which have both these processes. The coronoid process rises well above the mandibular condyle.

Dentition :—I. $\frac{2}{2}$, C. $\frac{1}{1}$, P. $\frac{4}{4}$, M. $\frac{1}{1}$=32.

The molars are two-rooted except the first, which, with the last, is smaller than the others. The incisors are notched transversely on the inner side of the crown. The canines are large. The molars have strong conical crowns with only slightly developed accessory cusps from a strong cingulum, the inner part of which is well developed.

All foregoing genera *Monachus, Ommatophoca, Leptonyx,* and *Stenorhynchus* agree together and differ from the genera *Phoca* and *Halichœrus* in having only four upper incisors; nails of pes rudimentary or absent, and the first and fifth digits of that extremity greatly exceeding the others in length. The six genera then may be arranged in two groups thus respectively characterized and named *Phocinæ* and *Stenorhynchinæ,* as has been done by Professor Flower [1].

Cystophora [2].—This genus of one species, of the North Atlantic and Arctic seas, is characterized by having the dorsal facial skin of the male capable of distension by the inflation of a sac which underlies it and is connected with the nostrils. The distended skin thus forms a sort of hood covering the dorsal part of the head. As in the *Stenorhynchinæ,* the first and fifth toes exceed the others. They also have prolonged cutaneous lobes. The nails are tolerably developed in all the extremities. There are 15 dorsal, 5 lumbar, 3 sacral, and 14 caudal vertebræ.

In the skull the premaxillæ do not rise to the nasals. The latter are small and not anchylosed together. The orbits are very large. The anterior nares are very wide, especially towards their upper part. The maxilla develops a small preorbital process. There is a large crista galli, but a small cerebellar fossa to the petrosal. There is a moderate-sized suborbital foramen, and there may be a deep fossa beneath or external to it, as is sometimes the case in *P. grœnlandica.* I have observed no defects of ossification between the pterygoid, palatine, and adjacent bones. If there are any defects of

[1] See his paper on the Mammalia in the Encyc. Brit. vol. xv. p. 443.

[2] *Phoca cristata,* Erxleben, Syst. Nat. p. 590; Fabric. Skrivt. af Naturh. Selsk. i. 2, p. 120, tab. 12. fig. 2; Desm. Mam. p. 241; Harlan, Fauna N. Y. p. 106.

Phoca mitrata, Cuvier. Oss. Foss., Atlas. ii. pl. 219. fig. 3.

Cystophora cristata, Nilsson, Vet. Akad. Handl. 1837; Gray, Voy. Erebus and Terror, Mamm. p. 4, Cat. Seals Brit. Mus. (1866) p. 40; Schreber, Fortgesetzt Wagner, vii. p. 48; Allen, N. Amer. Pinnipeds, pp. 462, 465, 724.

Phoque à Capuchon, Buffon, Hist. Nat. Supp. vi. p. 324.

ossification in the basi- and exoccipitals they are very small. The palate is much prolonged behind the last molars, and its hinder margin is concave. The palatine foramina are situated in its hinder half. There are both a subangular and an angular process to the ascending ramus of the mandible, but both these processes are very small. The skull agrees generally with that of *Phoca*, in points not here mentioned.

Dentition :—I. $\frac{2}{1}$, C. $\frac{1}{1}$, P. $\frac{4}{4}$, M. $\frac{1}{1}$=30.

Only the last upper molar has generally two roots. The roots of the molars are long and swollen; their crowns are small and rather plaited than lobed.

Macrorhinus[1].—This genus contains two species; one ranging the South Pacific, Indian, and Antarctic Oceans, and the other inhabiting the coasts of Mexico and Southern California. Here the claws of the manus are small, and those of the pes are quite rudimentary or altogether absent. The nose of the male has a short, dilatable proboscis. The first and fifth toes exceed the others and have prolonged cutaneous lobes.

There are 15 dorsal, 5 lumbar, 3 or 4 sacral, and 9–11 caudal vertebræ.

The skull has rather small nasals, which are separate and are not attained by the premaxillæ. The anterior nares are wide, especially dorsally, as in the last-described genus. The skull of this genus differs from all those of the genera yet noticed in that the posterior half of the petrosal and the condyloid foramina may look directly backwards. There is hardly any paroccipital process, and the mastoid process is only developed in old males. The palate may have a deeply concave hinder margin, or, being generally concave, may have a prominent process in its middle. The crista galli is large, but the cerebellar fossa of the petrosal is small. There are small venous channels in the supraoccipital which open on the dorsal margin of the foramen magnum. There is a deep groove behind the post-glenoid process, in which is a small glenoid foramen. There is a moderate suborbital foramen, with no deep fossa beneath it. I have observed no defects of ossification in the occipital or between the palatine and pterygoid and the sphenoid. The foramen ovale is thrown outside the vertical wall formed by the pterygoid, which passes backwards to join the petrosal.

There is a minute subangular process, pushed up very closely to the angular process, which itself is but little below the condyle.

Dentition :—I. $\frac{2}{1}$, C. $\frac{1}{1}$, P. $\frac{4}{4}$, M. $\frac{1}{1}$=30.

[1] *Phoca leonina*, Linn. Syst. Nat. i. (1765) p. 38.
Phoca elephantina, Molina, Sagg. sul Stor. nat. del Chili (1782), p. 280.
Phoca proboscidea, Péron, Voy. aux Terr. Austr. ii. (1817) p. 34, pl. xxxii.
Cystophora proboscidea, Nilsson, Vet. Akad. Handl. (1837); Schreber's Fortgesetzt Wagner, vii. p. 42.
Morunga elephantina, Gray, Cat. Seals Brit. Mus. (1866) p. 38.
Macrorhinus leoninus, Allen, N. Amer. Pinnipeds, pp. 463, 466, 743. See also Flower, P. Z. S. 1881, p. 145, an important memoir.
Grand Phoque à museau ridé, Buffon, Supp. vi. p. 316.

The canines are large, and the outer upper incisors rather so. The molars are small and simple in structure.

These two genera last described form a third small group, *Cystophorinæ*, distinguished from the preceding by the dilatable skin of the facial region of the males, the simple or plaited molars, and by the presence of but two incisors in the lower jaw.

The three subfamilies themselves agree in having backwardly extended hind limbs, hairy palms and soles, no external ear, no scrotum, well-developed canines in each jaw, five molars on either side of either jaw, no alisphenoid canal, no frontal postorbital process or only a small rudiment of such a structure, and a mastoid, which rarely shows itself very distinct and apart from the auditory bulla.

Trichechus [1].—The Walrus inhabits the northern parts of both the Atlantic and Pacific oceans. As is well known, its hind feet are not constantly turned backwards (as in *Phoca* and its allies) but are turned forwards during progression on land, but there is still no external ear and no scrotum. The eyes are rather small. The manus has five very small nails, and its digits are of about equal length, as are also the digits of the feet, except that the fifth is somewhat the longest. It and the first have flattened nails; those of the other digits are large, compressed, and pointed. Cutaneous lobes project beyond the nails of the first and fifth digits.

There are 14 dorsal, 6 lumbar, 4 sacral, and about 18 caudal vertebræ.

The humerus is much longer than the radius and but little shorter than the tibia, thus so far differing greatly from the skeletal structure of *Phoca*.

The general characters of the skull are so familiar to naturalists that it would be waste of time and space to give them here. It differs from that of *Phoca* in having no defects of ossification in the occipital or the vicinity of the pterygoid. The suborbital foramen is large. The zygomatic postorbital process, which is large, is formed exclusively by the malar. There is no frontal postorbital process. The anterior nares are small, heart-shaped, and very far forwards. They are entirely bounded by the premaxillæ and nasals, which join, but the former are widely separated from the frontals, and the latter (nasals) are quadrate and separate. The palate is long and wide, and is concave both antero-posteriorly and transversely. It has a more or less concave hinder margin, and the pterygoid develops distinct depending hamular processes. There is an alisphenoid canal.

The bulla is undivided and very little prominent. The meatus auditorius externus is not much produced outwardly. There is no paroccipital process, but a very large and dense mastoid process, with

[1] *Rosmarus*, Gesner, Hist. An. Aquat. (1558) p. 249.
Odobænus, Linn. Syst. Nat. i. (1735) p. 59.
Trichechus, Linn. Syst. Nat. i. (1766) p. 49; De Blainville, Ostéog.: Cuv. Oss. Foss., Atlas, ii. pl. 219 bis; Schreber's Fortgesetzt Wagner, vii. p. 77; Murie, Trans. Zool. Soc. vii. (1871) p. 411, pls. 51–55; Gray, Cat. Seals Brit. Mus. (1866) p. 35, and P. Z. S. (1853) pp. 112–116; Allen, N. A. Pinnipeds, pp. 5–186.

only a faint indication of the groove which so deeply divides it from the tympanic in *Phoca*. I could detect no glenoid foramen. The basis cranii is but little curved antero-posteriorly, convex downwards. There is a large crista galli, but a small cerebellar process to the petrosal. The condyloid foramen is larger and nearer the condyle than in any of the genera hitherto noticed, and indeed than in any other Pinniped. The zygomata are small, projecting much outwards at the glenoid surface, and thence sloping inwards and forwards.

The mandible shows a faint trace of a subangular process. The angle itself is placed very high up and is rather inflected.

Young dentition:—I. $\frac{3}{3}$, C. $\frac{1}{1}$, P. $\frac{4}{4}$, M. $\frac{1}{0}$.

Usual adult dentition:—I. $\frac{1}{0}$, C. $\frac{1}{1}$, P. $\frac{3}{3}$, M. $\frac{0}{0}=18$.

The enormous tusks and perfect simplicity and similarity of the other teeth, each with a flat grinding surface, have been again and again described.

Otaria [1].—According to Allen there are nine species of Otaries, which he arranges in six genera. Of these species the first and seventh come from the Galapagos and both coasts of South America; the second from the Auckland Islands; the third and sixth from both shores of the North Pacific; the fourth from California; the fifth from the Australian Seas; the eighth from the Cape of Good Hope; and the ninth from Australia, New Zealand, and the Antarctic Seas.

The Otaries turn the hind limbs forwards, and have a small external ear and also a scrotum, as is well known. The palmar and plantar surfaces are naked. The eyes are large. The nails are small or rudimentary, except those of the three middle digits of the pes.

There are 15 dorsal, 5 lumbar, 3 or 4 sacral, and 8–14 caudal vertebræ.

The skull has the anterior nares more vertical and nearer the anterior end of the skull than in the Seals. Otherwise the skull resembles that of *Phoca*, except in the following points:—There is a well-developed frontal postorbital process, and the postorbital process of the zygoma is formed by the malar only. There are no defects of ossification in the basioccipital and hardly any in the exoccipital; but there may be in the basisphenoid and in the place of the jugular and condyloid foramina. The petrotympanic is not bullate, but rugged and irregular, and the course of the carotid artery is plainly indicated along its inner border and is covered in beneath by a rather slight and imperfect ossification. The surface

[1] See Schreber, Fortg. Wagner, vii. p. 51; Péron, Voy. Terres Aust. ii. p. 4; Steller, Nov. Comm. Petrop. ii.; Nilsson, Vet.-Akad. Handl. (1837); Buffon, xiii. p. 53; Supp. vi. pp. 47, 48, 49; Cook's Second Voy. ii. p. 203; Quoy et Gaimard, Voy. Astrolabe, Mamm., and Zool. Uranie; Forster, Voy. round the World, ii.; Gray, Erebus and Terror, Cat. Seals Brit. Mus. (1866) p. 44; Clark, P. Z. S. 1873, p. 750, 1875, p. 650, 1878, p. 371, 1884, p. 189; Temminck, Fauna Japonica; Murie, Trans. Zool. Soc. vol. viii. p. 501; Gervais, Hist. Nat. Mamm. ii. p. 305; and especially Allen, N. Amer. Pinnipeds, p. 187.

of the bulla descends more and more mesiad, culminating in a ridge which is just external to this imperfect ossification. The lower lip of the meatus auditorius externus is not produced outwards; the mastoid process extends much further out and the meatus opens rather downwards. There is a very large paroccipital process, which is bent back and joins the very large mastoid process by a continuous undulating ridge, or wall, of bone.

The stylo-mastoid foramen is large, and not, as in the Seals, situated in a narrow groove between the mastoid and tympanic. There is a small postglenoid foramen. The palatine foramina are placed in the anterior half of the palate. There are great defects of ossification in the region of the spheno-palatine foramen. The basis cranii is curved, convex downwards, antero-posteriorly as in *Phoca*, but it is sharper and not so rounded. The alisphenoid is joined by a pointed prolongation of the parietal. There are small pterygoid fossæ and long hamular processes. There is an alisphenoid canal. There is a small or large preorbital process. A venous channel in the exoccipital opens inside the condyle. The condyloid foramen is larger than in the Seals.

The hinder part of the palate may be very deeply concave. The optic foramen opens singly into the cranial cavity. The cerebellar fossa of the petrosal seems generally very small. The premaxilla may develop a median process above the incisors. Besides enormous sagittal and lambdoidal ridges, there may be processes developed from the side of the skull like parts of a ridge extending backwards and downwards from the hinder part of the frontal to the lambdoidal ridge.

The mandible may have no subangular process or a small one, but there is a large "angle" very near the condyle and inflected as much as in any marsupial.

Dentition:—I. $\frac{3}{2}$, C. $\frac{1}{1}$, P. $\frac{4}{4}$, M. $\frac{1 \text{ or } 2}{1}$, $=34$ or 36.

The molars have mostly but one root and a crown, which would be conical but that it is more or less compressed, with a cingulum whence more or less of an anterior and posterior accessory cusp may be developed. The outer incisors are rather large and shaped like canines. The other incisors are each divided at the summit into two pretty equal cusps by a transverse groove.

Otaria and *Trichechus* must be accepted as representing two groups of about the same value as that which includes the remaining genera. Thus we have the arrangement already put forward by Mr. Turner and Professor Flower, which may be shortly tabulated as follows:—

Pinnipeds with external ears and an alisphenoid canal	OTARIIDÆ. *Otaria.*
Without external ears, but with an alisphenoid canal	TRICHECHIDÆ. *Trichechus.*

With neither external ears nor alisphenoid canal	PHOCIDÆ.
Phocidæ with incisors $\frac{2}{1}$	CYSTOPHORINÆ.
A cranial pouch	*Cystophora.*
A proboscis	*Macrorhinus.*
Phocidæ with incisiors $\frac{2}{2}$	STENORHYNCHINÆ.
Nasals not prolonged backwards	*Leptonyx.*
Nasals prolonged backwards.	
Orbits very large. Teeth very small	*Ommatophoca.*
Orbits not very large { Teeth much lobed	*Stenorhynchus.*
Orbits not very large { Not much lobed	*Monachus.*
Phocidæ with incisors $\frac{3}{2}$	PHOCINÆ.
Anterior nares very high. Molars little lobed	*Halichœrus.*
Anterior nares not very high. Molars considerably lobed	*Phoca.*

CHARACTERS OF THE PINNIPEDIA GENERALLY.

It may possibly be useful to enumerate the following characters which I have examined in different genera of Pinnipeds. Some of these are different in different groups, as has in part been already indicated.

(1) I have found no complete septum in the auditory bulla of any genus.

(2) The lip of the meatus auditorius externus projects greatly outwards in the *Phocidæ*; but it is not the median inferior part of the lip as in the Bears, but posteriorly as in the Otters. It is not prolonged outwards in the *Otariidæ* and *Trichechidæ*.

(3) The paroccipital process is more or less triangular, and directed outwards, downwards, and backwards, except in *Trichechus*, where it forms but a small buttress against, and uniting with, the hinder side of the great mastoid.

(4) The mastoid process may be considerably prominent (as in *Otaria*) or extremely so (as in *Trichechus*), or may form part of a wide-spread rounded prominence (as in the *Phocidæ*). It may form a continuous bone wall with the paroccipital process (as in *Otaria*), or be separated from it (as in the *Phocidæ*), or blend with it (as in *Trichechus*).

(5) The carotid foramen is always large and conspicuous, and is placed towards, or almost at the hinder end of, the bulla, which the carotid canal traverses, towards or along its inner margin—its course being indicated externally in *Otaria* and *Trichechus*, but not at all in the *Phocidæ*. It is never concealed (as it is in the Bears) by a projecting lip of the basi-occipital.

(6) The condyloid foramen is always distinct and exposed, and

never overlapped by a ridge of bone running from the par-occipital process to the condyle, and never opens into, though it appears sometimes to coalesce with, the foramen lacerum posterius.

(7) The glenoid foramen is always very small, and is sometimes not to be detected.

(8) The alisphenoid canal may be present or absent, as already mentioned more than once.

(9) The suborbital foramen is always rather large; but never as large relatively as in *Lutra* and *Enhydra*. It is largest in *Trichechus*.

(10) The frontal postorbital process present in *Otaria* and *Trichechus* is never more than a rudiment in the *Phocidæ*.

(11) The zygomatic postorbital process is formed both by the malar and squamosal in the *Phocidæ*, mainly by the malar in *Otaria*, and entirely by it in *Trichechus*.

(12) The alisphenoid and parietal always join by a narrow process of the latter bone.

(13) The premaxillæ never ascend to join the frontals.

(14) There is never a lachrymal foramen.

(15) The basis cranii is nearly always bent, so as to be convex downwards.

(16) The anterior nares are quite terminal in *Trichechus*, rather more distant from the end of the muzzle in *Otaria*, and not at all terminal, but looking more or less exteriorly upwards as well as forwards, in the *Phocidæ*.

(17) The opening represents both the foramen rotundum and the spheno-orbital fissure.

(18) The optic foramina open into the cranial cavity by a single aperture in *Otaria* and in *Stenorhynchus*, but not in the *Phocidæ* generally, as in *Trichechus*.

(19) The palate always extends backwards much behind the last molars, but is not commonly narrowed behind save in *Otaria*. It is not at all so narrowed in *Trichechus*.

(20) Defects of ossification commonly occur in the occipital in the *Phocidæ*, but not in *Otaria* and *Trichechus*.

(21) A preorbital process exists in *Otaria* and *Trichechus*; sometimes, but rarely, in the *Phocidæ*.

(22) The angle of the mandible is inflected (as in Marsupials) in *Otaria*, but not in the other genera.

It is now generally agreed to regard the Pinnipeds as derived from Ursine Arctoids; and there can be little doubt as to this origin as regards *Otaria*. But it is not absolutely necessary that the whole Order of Pinnipeds should have had but a single origin. It is at least conceivable that the Otaries might have been derived from Bear-like animals, while the *Phocidæ* had another, possibly a Lutrine, origin. If this hypothesis were correct, the Pinnipeds would of course consist of two strains which have gradually grown to be more and more alike. I have no intention of maintaining the probable truth of the hypothesis; but, nevertheless, it may be well to enumerate the anatomical reasons which might be advanced in support of it:—

(1) In the *Phocidæ*, as in *Lutra*, there is no alisphenoid canal, while in both *Otaria* and *Ursus* it is present.

(2) In the *Phocidæ* and *Lutra* the paroccipital and mastoid processes are not united by a prominent ridge of bone, while in *Otaria* and *Ursus* they are so united.

(3) In the *Phocidæ* and *Lutra* the mastoid process does not much depend; in *Otaria* and *Ursus* it depends considerably.

(4) The bulla of *Lutra* could be easily made to resemble that of *Phoca* by giving a rounded form to the mastoid; in both genera there is the same sort of groove between the mastoid and the tympanic. The bulla of *Otaria*, on the contrary, is exceedingly like that of *Ursus*, and in both those genera the sort of groove which exists between the mastoid and tympanic in *Lutra* and *Phoca*, is absent.

(5) The angle of the mandible is very large in *Otaria* and *Ursus*, while in *Lutra* and *Phoca* it is smaller.

(6) The femur is very short in *Lutra* and *Phoca*; it is considerably longer relatively in *Otaria* and *Ursus*.

(7) In *Lutra* and *Enhydra* the floor of the orbit formed by the maxilla is very large, and it is also in *Leptonyx*, at least, amongst the *Phocidæ*, while in others of that family it is of moderate size. It is very small in *Otaria* and *Trichechus*, as it also is in *Ursus*.

(8) There are noteworthy defects of ossification in the cranial walls in *Lutra* and the *Phocidæ*. There are no such defects in *Ursus* or *Trichechus*, while they are but of small extent in *Otaria*.

(9) The suborbital foramen is very large in *Lutra* and *Phoca barbata* and *Trichechus*. It is small in the Bears, and of moderate size in most Otaries.

On the other side it may be urged that:—

(1) The postorbital process is formed entirely by the malar in *Otaria*, *Lutra*, and *Ursus*, while it is formed in part also by the squamosal in the *Phocidæ*—as it may be in *Canis*.

(2) There is a postorbital process to the frontal in *Lutra* and *Ursus* as well as in *Otaria*, while it is entirely, or all but entirely, absent in the *Phocidæ*.

The Distribution of the Pinnipedia.

The Pinnipeds are pretty equally divided between the Northern and Southern Hemispheres, there being about 14 northern and 11 southern species. Of the 9 genera, 5 (namely *Phoca*, *Halichœrus*, *Monachus*, *Cystophora*, and *Trichechus*) are northern forms, while *Stenorhynchus*, *Leptonyx*, and *Ommatophoca* are all three exclusively southern. *Macrorhinus* is equally divided, one of its species being northern and the other southern; while *Otaria* has three northern and six southern species. In the Arctic and North Temperate zones we have all the species of *Phoca*; *Monachus* in the Mediterranean; *Cystophora* in the North Atlantic; and *Phoca* and two species of Otaries in the North Pacific. In the Indian Ocean we have one species of *Macrorhinus*. At the Cape of Good Hope we have an Otary. Two other Otaries are found about Australia and New Zealand. On the coast of Central America we have an Otary and *Macrorhinus*, while two other Otaries frequent the coasts of South America, and one inhabits the Aucklands. In the Southern and Antarctic Seas we have the two species of *Stenorhynchus*, with *Leptonyx*, *Ommatophoca*, a *Macrorhinus*, and an Otary.

A few species range over both the New and Old Worlds, in the Arctic region, and the opposite coasts of the North Atlantic and Pacific Oceans.

	Phoca vitulina.	*Steno-rhynchus leptonyx.*	*Cysto-phora cristata.*	*Otaria jubata.*	*Triche-chus.*
	"	"	"	"	"
Length of cervical region...	20·5	......	......	37·0	33·0
" dorsal region ...	54·0	......	......	85·0	95·5
" lumbar region ...	22·0	......	......	32·0	49·0
" sacrum...........	12·5	......	......	17·0	22·0
" caudal region ...	13·5	......	......	24·5	30·0
Length from atlas to end of sacrum	109·0	......	......	171·0	199·5
Length of pectoral limb ...	36 5	......	......	87·0	70·5
" pelvic limb	56·5	......	......	85·0	104·5
" humerus	11·0	......	......	23·0	30·5
" radius	11·0	......	......	24·0	23·0
" femur	10·0	......	......	17·0	24·0
" tibia..............	21·7	......	......	28·0	34·5
" 3rd metacarpal .	3·7	......	......	8·0	7·0
" 3rd metatarsal...	5·1	......	......	10·0	11·7
" 1st metacarpal...	5·0	......	......	15·0	10·0
" 1st metatarsal...	7·4	......	......	12·5	12·0
" 3rd phalanx of 3rd digit (manus).........	2 5	......	......	3·0	2·7
Length of 3rd phalanx of longest digit (manus) ...	2·7 (1st)	......	......	5·0 (2nd)	5·8 (1st)
Length of 3rd phalanx of 3rd digit (pes)	2·0	......	......	3·5	3·5
Length of 3rd phalanx of longest digit (pes).........	4·0 (1st)	......	......	5·0 (2nd)	3·3 (5th)
Basion to premaxilla	20·0	36·0	25 5	32·0	33·0
Length of palate	9·0	14·5	13 0	22·0	17·0
Breadth of palate	5·2	7·6	5·0	6·0	6·5
Greatest breadth of zygomata	12·8	19·4	21·5	22·5	22·7
Greatest breadth of brain case.........................	9·6	13·0	12·5	10·2	16·5
Narrowest interorbital space	1·4	3·7	4·0	4·4	7·2
Length from canine to behind last lower molar ...	5·6	11·6	4·9	10·3	7·8
Length of $\frac{\text{P. 4}}{}$	0·8	1·6	0·8	0·8	......
Breadth of $\frac{\text{P. 4}}{}$.............	0·4	0·9	0·5	0·6	......
Length of $\frac{\text{M. 1}}{}$	0·7	1·6	0·7	0·9	......

Proportions borne to the spine from the atlas to the end of the sacrum, taken at 100, of:—

	Phoca.	*Otaria.*	*Trichechus.*
Cervical region	18·8	21·6	16·5
Dorsal region	49·5	49·7	47·8
Lumbar region	20·1	18·7	24·5
Sacral region	11·4	9·9	11·0
Caudal region	12·3	14·3	15·0
Pectoral limb	33·4	50·8	35·3
Pelvic limb	51·8	49·7	52·3
Humerus	10·0	13·4	15·2
Radius	10·0	14·0	11·7
Femur	9·1	9·9	12·0
Tibia	19·9	16·3	17·2
3rd metacarpal	3·3	4·6	3·5
3rd metatarsal	4·6	5·8	5·8
1st metacarpal	4·4	8·7	5·0
1st metatarsal	6·7	7·3	6·0
3rd phalanx of 3rd digit (manus)	2·2	1·7	1·3
3rd phalanx of longest digit (manus)	2·4	2·9	2·9
3rd phalanx of 3rd digit (pes)	1·8	2·0	1·7
3rd phalanx of longest digit (pes)	3·6	2·9	1·6
Basion to premaxilla	18·3	18·7	16·5
Length of palate	8·2	12·8	8·5
Breadth of palate	4·7	3·5	3·2
,, zygomata	11·7	13·1	11·3
,, brain-case	8·2	5·9	8·2
,, interorbital space	1·2	2·5	3·6
Length of lower dental series	5·1	6·0	3·9
Length of $\frac{\text{P. 4}}{}$	0·7	0·4	......
Breadth of $\frac{\text{P. 4}}{}$	0·3	0·3	......
Length of $\frac{\text{P. 4}}{}$	0·6	0·5	......

Proportions borne to the skull from basion to premaxilla, being taken at 100, of:—

	Phoca.	*Steno-rhynchus.*	*Cysto-phora.*	*Otaria.*	*Triche-chus.*
Length of palate	45·0	40·2	50·9	68·7	51·5
Breadth of palate	26·0	21·1	11·7	18·7	19·6
,, zygomata	64·0	53·8	84·3	70·3	68·7
,, brain-case	43·0	36·1	49·0	31·8	50·0
,, interorbital space	7·0	10·2	16·8	13·7	21·8
Length of lower dental series	28·0	32·2	19·2	32·1	23·6
Length of $\frac{\text{P. 4}}{}$	4·0	4·4	3·1	2·5	......
Breadth of $\frac{\text{P. 4}}{}$	2·0	2·5	1·1	1·8	......
Length of $\frac{\text{M. 1}}{}$	3·5	4·4	2·7	2·8	......

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TURNIX POWELLI.

Proportions borne to the entire pectoral limb, taken at 100, of:—

	Phoca.	*Otaria.*	*Trichechus.*
Pelvic limb	154·7	97·7	148·2
Humerus	30·1	26·4	43·2
Radius	30·1	27·5	32·6
3rd metacarpal	10·1	9·1	9·9
1st metacarpal	13·7	17·2	14·1
3rd phalanx of longest digit (manus)	8·3	5·7	8·2

Proportion to pelvic limb, taken at 100, of:—

	Phoca.	*Otaria.*	*Trichechus.*
Femur	17·7	20·0	22·9
Tibia	38·4	32·9	32·5
3rd metatarsal	9·0	11·7	11·1
1st metatarsal	13·0	14·7	11·4
3rd phalanx of longest digit (pes)	7·0	5·8	3·1

2. Report on the Collections of Birds made during the Voyage of the Yacht 'Marchesa.'—Part III. On the Collection of Birds from the Island of Sumbawa. By F. H. H. Guillemard, M.A., M.D., F.L.S., &c.

[Received April 28, 1885.]

(Plate XXIX.)

In the month of August, 1883, Mr. Kettlewell, in his yacht 'Marchesa,' paid a short visit to the island of Sumbawa, with the intention of visiting the great Tambora volcano, and, if possible, of making the ascent. This, however, was found to be beset with so many difficulties as to be impracticable, and the yacht left after a stay of little over a week, having merely touched at two or three places on the north coast of the island. With such very restricted opportunities but little could be done, and I considered myself fortunate in obtaining a small collection comprising examples of some thirty-eight species.

I am not aware of any account of the Sumbawan avifauna having been published in our own language, and Dr. Jentink informs me that he knows of none from the pen of any Dutch naturalist; but, from the position of the island, and the researches of Mr. Wallace in Lombok and Flores, few novelties could be expected. The present collection, as far as it goes, bears out this expectation, for, with one or two exceptions, all the species are found on one or both of the last-named islands, and I have but two new species to record. One of these, a *Turnix*, somewhat resembles *T. rufilatus* of Wallace, but is characterized by the absence of rufous on the under surface. The other, a *Zosterops*, coexists on the island with another of the same genus (*Z. brunneicauda*).

1. Cacatua sulphurea, Vieillot.

Cacatua sulphurea, Schleg. Mus. Pays-Bas, 5me livr. p. 137 (1864); *id. ibid.* 11me livr. p. 66 (1874); Wald. Tr. Z. S. vol. viii. pt. 2, 1872, p. 30.

Plissolophus cristatus, Reichenow, Consp. Psittac. p. 29 (1882).

Hab. Celebes (*Forsten*); Flores and Lombok (*Wallace*); Sumbawa (*Guillemard, Reinwardt*); Timor (*S. Müller*).

a, b. ♂. Bima, Sumbawa.

c. ♀. Bima, Sumbawa.

Iris brown; bill black; feet and tarsus black. Length 35·1 centims.; wing 23·0 centims. The sulphur colour is irregularly distributed on the forehead, ear-coverts, cheeks, and throat.

This species was met with in flocks on the Sumbawa river.

2. Geoffroyus jukesi, G. R. Gray.

Geoffroyus jukesii, Wall. P. Z. S. 1863, p. 484; Reichenow, Consp. Psitt. p. 137 (1882.)

Eclectus personatus, Schleg. Mus. Pays-Bas, 11me livr. p. 18 (*partim*).

Hab. Timor and Flores (*Wallace*); Sumbawa (*Guillemard*).

a–d. ♂. Bima, Sumbawa.

e, f. ♀. Bima, Sumbawa.

Iris lemon-yellow; bill scarlet, yellowish at tip; feet greyish olive. Length 24·8–25·5 centims.; wing 16·2–16·7 centims.: bill of female brown; other soft parts as in male; wing 14·8–15·3 centims.

The under wing-coverts and subalars are bright cobalt in some, in others more greenish. I have retained Gray's specific name, as the present examples seemed nearest to Flores individuals; but they do not appear to me to be really separable from Timor and other birds.

3. Trichoglossus forsteni, Bonaparte.

Trichoglossus forsteni, Schleg. Mus. Pays-Bas, 5me livr. p. 111 (1864); *id. ibid.* 11me livr. p. 46 (1874); Reichenow, Consp. Psittac. 1882, p. 93.

Hab. Sumbawa (*Forsten, Guillemard*).

a. ♂. Bima, Sumbawa.

Bill red, yellow at tip; feet olive-green. Length of wing 13·7 centims.

4. Haliastur intermedius, Gurney.

Haliastur intermedius, Gurney, Ibis, 1865, p. 28; *id.* 1866, p. 247; Wardlaw Ramsay, Orn. Works Tweedd. p. 655.

Hab. Malay peninsula, Sumatra, Borneo, Philippines, Celebes, Java, "Timor group" (*Salvad.*); Sumbawa (*Guillemard*).

a, Gunong Api I., Sumbawa.

Iris light brown; bill slate, apex yellowish; nasal sheath yellow; tarsus yellow. Length 49·1 centims.; wing 40·8 centims.

5. Yungipicus grandis, Hargitt.

Iyngipicus grandis, Hargitt, Ibis, 1882, p. 45.

Hab. Flores and Lombok (*Wallace*); Sumbawa (*Guillemard*).

a. ♂. Bima.

Iris reddish brown; bill nearly black; tarsus dirty black. Length 13·2 centims.; wing 8·3 centims.; tail 5·0 centims.; bill 1·8 centim.; tarsus 1·5 centim.

6. Merops philippinus, Linnæus.

Merops philippinus, Schleg. Mus. P.-B. *Merops*, p. 2 (1863); Wald. Tr. Z. S. viii. 2, p. 42; *id.* ix. pt. 2, p. 149; Salvad. Ucc. di Born. p. 89.

Hab. India, Malay peninsula, Sumatra, Java, Borneo, Philippines, Celebes, Timor, Flores (*Wallace*); Lombok (*Gray*); Sumbawa (*Guillemard*).

a, b. ♂. Bima, Sumbawa.

c. Sumbawa town.

d. Bima, Sumbawa.

Iris red; bill black; feet greyish black. Length 29·0–29·4 centims.; wing 12·5–13·0 centims.

7. Merops ornatus, Latham.

Merops ornatus, Bp. Consp. Av. i. p. 162; Schleg. Mus. P.-B., *Merops*, p. 4 (1863); Salvad. Orn. della Pap. i. p. 401.

Hab. From Celebes through the Moluccas and New Guinea to New Britain, Torres Straits (*MacGillivray*); Java (*Finsch*); Lombok (*Wallace*); Sumbawa (*Forsten*); Flores (*Wallace*); Timor (*Wallace*).

a. Sumbawa tôwn.

Iris dull red; bill and feet black. Length 25·4 centims.; wing 10·6 centims.

8. Eurystomus orientalis (Linnæus).

Eurystomus orientalis, G. R. Gray, Hand-l. B. i. p. 76, sp. 906; Salvadori, Orn. della Pap. i. p. 508.

Hab. From India through China to the Philippines; Sumatra, Borneo, Java, and Celebes; Gilolo (*Bruijn*); Lombok (*Wallace*); Sumbawa (*Guillemard*); Flores, Timor (*Wallace*).

a. ♂. Sumbawa town.

b. ♀. Sumbawa town.

Iris dull pinkish red; bill scarlet, black at tip; feet dull coral-red. Length 29·0 centims.; wing 19·0–19·4 centims. The female is a very dark bird, and neither example possesses the pallor of colouring that is characteristic of the more eastern race.

9. ALCEDO BENGALENSIS, Gmelin.

Alcedo bengalensis, Salvad. Orn. della Pap. vol. i. p. 407; Sharpe, Monogr. Alced. pl. 2; G. R. Gr. Hand-l. i. p. 95, sp. 1152.

Hab. From the Red Sea to China and Japan. Sumbawa (*Guillemard*); Flores (*Wallace*); Timor (*S. Müller*).

a. ♂. Sumbawa.

Iris brown; bill entirely black (5·0 centims.); feet orange-red.

10. SAUROPATIS CHLORIS (Boddaert).

Sauropatis chloris, Salvad. Orn. della Pap. vol. i. p. 470; *id.* Ucc. di Born. p. 103.

Halcyon chloris, Sharpe, Monogr. Alced. pl. 89.

Hab. Generally distributed from the Red Sea to New Ireland. Java (*Horsfield*), Lombok, Flores, Solor, and Timor (*Wallace*); Sumbawa (*Guillemard*).

a, b. Sumbawa.

Iris brown; bill black, base of lower mandible yellowish white; tarsus black.

11. CAPRIMULGUS MACRURUS, Horsfield.

Caprimulgus macrurus, Horsf. Tr. Linn. Soc. xiii. p. 142 (1821); G. R. Gr. Hand-l. i. p. 57, sp. 633; Salvad. Orn. della Pap. i. p. 528.

Hab. India, Malay peninsula, Philippines, Moluccas, New Guinea, New Britain, Sumatra, Java (*Bernstein*); Lombok and Timor (*Wallace*); Sumbawa (*Guillemard*).

a. ♂. Bima, Sumbawa.

Iris brown; bill flesh-coloured, black at tip; feet dull flesh-coloured. Length of wing 18·8.

12. CAPRIMULGUS AFFINIS, Horsfield.

Caprimulgus affinis, Horsf. Tr. Linn. Soc. xiii. p. 142 (1821); G. R. Gr. Hand-l. i. p. 57, sp. 635; Salvad. Ucc. di Born. p. 115.

Hab. Borneo, Sumatra, Celebes, Java (*Horsfield*); Timor, Lombok (*Wallace*); Sumbawa (*Guillemard*).

a–c. Bima, Sumbawa.

Iris brown; bill brown, black at tip; feet brown. Length 22·0 centims.; wing 15·6–16·2 centims.

At the beginning of the month of August great numbers of Nightjars were to be found at dusk hawking over the dry *padi* fields in the neighbourhood of Bima. Some belonged to the preceding species, but the great majority, I believe, to the present. In no other part of the world have I seen birds of this genus in such abundance.

13. CENTROCOCCYX AFFINIS (Horsfield).

Centrococcyx affinis, Horsf. Tr. Linn. Soc. xiii. p. 180 (1821); Wald. Tr. Z. S. vol. viii. pt. 2, p. 56.

Hab. Celebes (*Wallace*); Java (*Horsfield*); Lombok, Flores, and Timor (*Wallace*); Sumbawa (*Guillemard*).

a. Labuan-penakan, Sumbawa.

14. Lanius bentet, Horsfield.

Lanius bentet, Horsf. Tr. Linn. Soc. xiii. p. 144 (1821); Gadow, Cat. Birds, viii. p. 266.

Lanius schach (partim), Horsf. & Moore, Cat. B. M. E. I. Co. i. p. 163.

Hab. Lombok, Timor, Java (*Wallace*); Sumatra (*Bock*); Sumbawa (*Guillemard*).

a, ♂. Sumbawa town.

b, c. ♀. Sumbawa town.

d. Sumbawa.

Iris brown; bill and tarsus black. Length 22·0–24·9 centims.; wing 8·6–9·0 centims.

These examples are interesting on account of the differing amount of distribution of the black on the head. In *a*, an individual which has probably not reached maturity, the forehead alone is black, the vertex is slightly streaked with that colour, and the mantle is dusky. The abdomen is strongly tinged with rufous, not white as in the other skins. In *b* the black is also confined to the forehead, the vertex, occiput, and mantle being clear grey, but on the cheeks the black does not pass beyond the ear-coverts, while in *c* and *d* the head is black as far as the occipital region, and the black passes over the ear-coverts on to the sides of the neck. The last three examples have the abdomen pure white, and the secondaries strongly edged with buffish white.

15. Pachycephala fulvotincta, Wallace.

Pachycephala fulvotincta, Wall. P. Z. S. 1863, pp. 486, 492; Gadow, Cat. B. vol. viii. p. 196.

Hab. Flores (*Wallace*); Sumbawa (*Guillemard*).

a. ♀. Gunong Api Id., Sumbawa.

Iris brown; bill black; tarsus bluish black. Length of wing 8·1 centims.; tail 6·5 centims.

From a comparison with the type in the British Museum collection, I have referred the present example to this species, though, owing to my not having been able to obtain the male bird, the diagnosis must be to a certain extent conjectural.

16. Artamus leucorhynchus (Horsfield).

Leptopteryx leucorhynchus, Horsf. Tr. Linn. Soc. xiii. p. 144 (1821).

Artamus leucorhynchus, Salvad. Ucc. di Borneo, p. 140; *id.* Orn. della Pap. ii. p. 167.

Hab. Andamans, Sumatra, Borneo, Philippines, Celebes, Moluccas, New Guinea, Torres Straits; Java (*Horsfield*); Lombok, Flores (*Wallace*); Sumbawa (*Guillemard*); Timor (*Wallace*).

a. ♀. Sumbawa.

b. Sumbawa.

Iris brown; bill leaden blue; tarsus greyish black. Length of wing 13·4–13·6 centims.

Both individuals are probably in immature plumage; there is no sharply defined line between the white breast and the dark grey of the head and neck.

17. PRATINCOLA CAPRATA, Linnæus.

Pratincola caprata, Bp. Consp. i. p. 305; G. R. Gr. Hand-l. i. p. 228, sp. 3282; Sharpe, Cat. B. vol. iv. p. 195.

Hab. Persia, India, Burmah, Philippines, Celebes; Lombok, Flores, Timor (*Wallace*); Sumbawa (*Guillemard*).

a. ♂. Labuan Penakan, N. Sumbawa.

b. ♀. Gunong Api I., Sumbawa.

Iris dark brown; bill and feet black in the male, dark brown in the female. Length of wing 7·0 and 6·9 centims.

With the exception of the under tail-coverts and the tips of two or three feathers on the lower abdomen, the under surface of the male is entirely black. In the female both upper and under tail-coverts are rufescent white.

18. LALAGE TIMORIENSIS (S. Müller).

Lalage timoriensis, Bp. Consp. i. p. 355; Salvad. Ucc. di Born. p. 147; Sharpe, Cat. Birds, vol. iv. p. 94.

Hab. Bali, Lombok (*Wallace*); Sumbawa (*Guillemard*); Timor (*Wallace*); Borneo? (*Finsch*).

a. Juv. ♀. Bima, Sumbawa.

Iris brown; bill dark brown; feet bluish black. Length of wing 9·3 centims.

19. CHIBIA BIMAENSIS (Bonaparte).

Chibia bimaensis, Sharpe, Cat. Birds, vol. iii. p. 237.

Dicrurus bimaensis, Wall. P. Z. S. 1863, p. 494.

Hab. Lombok and Flores (*Wallace*); Sumbawa (*Guillemard*).

a. Sumbawa.

b. ♀. Bima, Sumbawa.

c. ♀. Labuan Penakan, Sumbawa.

d. ♂. Gunong Api Island, Sumbawa.

Iris crimson; bill and feet black. Wing 13·2–13·6 centims. Two specimens are marked with white on the abdomen, and have the under tail-coverts tipped with white. The hairy frontal tuft is only well marked in one example, a chin-tuft of like nature coexisting. Agree with Mr. Wallace's Lombok specimens in the British Museum, but appear to be of somewhat smaller dimensions.

20. HYPOTHYMIS OCCIPITALIS, Vigors.

Hypothymis occipitalis, Vig. P. Z. S. 1831, p. 97; Sharpe, Cat. B. vol. iv. p. 275.

Hab. Andamans, Malacca, Sumatra, Borneo, Formosa; Lombok (*Wallace*); Sumbawa (*Guillemard*); Flores (*Wallace*).

a, b. ♂. Sumbawa.

c. ♂. Bima.
d. Juv. ♂. Bima.

Iris marked "yellow" in one example; in two others dark brown; bill blue; tarsus blue. Length of wing 6·9–7·2 centims.

Abdomen and crissum bluish grey. All the adults have the nape spot, but only one the pectoral band. The under wing-coverts are white. The young male has the upper surface grey, the wings brown, throat light grey, and abdomen dirty white. A few bright blue feathers are appearing on the head.

21. Oriolus broderipi, Bonaparte.

Oriolus broderipi, Wall. P. Z. S. 1863, p. 485; Sharpe, Cat. Birds, vol. iii. p. 201.

Hab. Lombok, Flores (*Wallace*); Sumbawa (*Guillemard*).
a–c. ♂. Sumbawa town.
d. Juv. ♂. Sumbawa town.

Iris crimson, duller in the young bird; bill pink; feet bluish black. Length 28·4–29·0 centims., wing 15·4–16·3 centims. The young male is altogether paler, lacking the brilliant orange tint of the full adult. The secondaries are, however, quite as much marked with yellow as in the latter, but the yellow frontal patch is smaller. Several small flocks of this species were seen on the road from the coast up to the town of Sumbawa.

22. Parus cinereus, Vieillot.

Parus cinereus, Vieill. Tab. Ency. Méth. ii. p. 506; Gadow, Cat. Birds, viii. p. 16.

Hab. India and Southern China (?); Java (*Buxton*); Flores, Lombok (*Wallace*); Sumbawa (*Guillemard*).
a. ♂. Bima, Sumbawa.
b. ♂. Gunong Api Island, Sumbawa.

Iris brown; bill and feet black. Length 13·3 centims., wing 6·4–6·7 centims. Mantle pure grey. Note exactly like our own *P. major*.

Gunong Api Island lies close off Bima on the north coast of Sumbawa, and must not be confused with another island of the same name in the Banda Sea.

23. Cinnyris pectoralis (Horsfield).

Cinnyris pectoralis, Bp. Consp. Av. i. p. 408, no. 43; Shelley, Monogr. Nect. p. 165, p. 53; Gadow, Cat. Birds, ix. p. 88.

Hab. Nicobar Islands (*Wimberley*); Malacca and Sumatra (*Wallace*); Java (*Horsfield*); Lombok and Flores (*Wallace*); Sumbawa (*Guillemard*); Borneo (*Low*).
a, b. ♂. Sumbawa town.
c, d. ♂. Bima, Sumbawa.
e. ♂. Gunong Api Island, Sumbawa.

Iris reddish brown; bill black; feet brownish black. Length 10·8–11·3 centims.; wing 5·2–5·4 centims.

24. Zosterops brunneicauda, Salvadori.

Zosterops brunneicauda, Salvad. Ann. Mus. Civic. Genov. xvi. p. 82; id. Orn. Pap. e delle Molucche, ii. p. 373; Gadow, Cat. B. vol. ix. p. 190.

Hab. "Islands of Ceram Laut, Choor, and the Aru group;" Sumbawa (*Guillemard*).

a. ♂. Bima, Sumbawa.

Iris brown; bill brown; feet slate-coloured; wing 5·6 centims. This individual is in no way separable from the British-Museum example of *Z. brunneicauda.*

25. Zosterops sumbavensis, sp. nov.

♂. Z. brunneicaudæ *paullo similis, sed colore aureo universo, ac pileo brunneo, præcipue diversus. Superne aureo-viridis; fronte læte aurea; annulo ophthalmico albo lato; macula præoculari nigricante; regione parotica brunnescente; toto corpore subtus læte aureo; iride brunnea. Long. tot.* 0·110 *m.*; *al.* 0·056 *m.*; *caud.* 0·046 *m.*; *rostr.* 0·011 *m.*; *tars.* 0·016 *m.*

Hab. Sumbawa (*Guillemard*).

a. ♂. Bima, Sumbawa.

b. Bima, Sumbawa.

The general golden yellow colour of this species distinguishes it from *Z. brunneicauda*, as also does the brown of the vertex and occiput. In *b* (marked "♀?") this latter characteristic is not so marked.

26. Stigmatops ocularis (Gould).

Stigmatops ocularis, Salvad. Orn. della Pap. ii. p. 323.

Hab. Lombok (*Wallace*); Sumbawa (*Guillemard*); Timor (*Wallace*); New Guinea (*Bonaparte*); New Holland (*Gould*).

a. ♂. Bima, Sumbawa.

b, c. ♂. Sumbawa town.

d. Bima.

e. Sumbawa town.

Iris brown; bill black; feet and tarsus slate. Sexes alike. Length of wing 7·3–7·7 centims.

Common round Bima, where they fed on the flowers of the Bombax and other trees. Their habits resemble those of the genus *Cinnyris.*

27. Stigmatops, sp.

At Bima and Sumbawa two quite young birds of the genus *Stigmatops* were obtained that I hesitate to refer to any particular species. The head is olive; the chin, cheeks, upper throat, and ear-coverts are washed with yellow, as are also the abdomen and under tail-coverts; and the tail is more brightly tinged with greenish yellow than is the case in *S. ocularis.* Whether it is the young of the latter it is difficult to say, but it agrees closely with the description of the adult *S. chloris* of Salvadori.

28. PHILEMON TIMORIENSIS (S. Müller).

Tropidorhynchus timoriensis, Gray, Hand-l. i. p. 160, sp. 2088; Bp. Consp. i. p. 390.

Hab. Lombok (*Wallace*); Sumbawa (*Guillemard*); Flores and Timor (*Wallace*).

a, b. ♂. Sumbawa town.
c. ♀. Bima, Sumbawa.
d. ♀. Sumbawa town.
e–h. Sumbawa town.

Iris reddish brown; bill black; tarsus bluish ash; bare skin on head and neck dark brown. Length 30·5–31·8 centims.; wing 14·0–14·8 centims. This species appears to vary considerably in the shade of colour of the under surface and the amount of striping on the neck. The individual *c* is more or less immature; the upper surface is interspersed with light brown feathers, the upper tail-coverts are buff, the edges of the outer webs of the secondaries are washed with dull greenish yellow, and there is hardly any striping on the neck.

This species occurred, in small flocks of eight or ten individuals, in great numbers on the road up to the town of Sumbawa, keeping up a continuous noisy chatter. The note is very loud and harsh. They were afterwards found to be tolerably common at all the places visited on the island.

29. CALORNIS MINOR (Müller).

Calornis minor, Gray, Hand-l. ii. p 26, sp. 6375; Bp. Consp. 417; Wald. Tr. Z. S. viii. p. 80.

Hab. Lombok, Flores, Timor (*Wallace*); Sumbawa (*Guillemard*).

a–c. ♂. Bima, Sumbawa.
d. Sumbawa.

Iris orange-scarlet; bill and feet black. Length of wing 9·5–10·2 centims.

30. AMADINA INSULARIS, Wallace.

Amadina insularis, Wall. P. Z. S. 1863, p. 495.

Hab. Timor and Flores (*Wallace*); Sumbawa (*Guillemard*).

a–c. ♀. Bima, Sumbawa.

Iris reddish brown; bill orange, bright red in the male; feet yellowish. Length of wing 5·0–5·3 centims.

31. OSMOTRERON VERNANS (Linnæus).

Osmotreron vernans, G. R. Gray, P. Z. S. 1860, p. 360; Wald. Tr. Z. S. vol. ix. pt. 2, p. 210; Bp. Consp. ii. p. 12.

Treron viridis, Wallace, Ibis, 1865, p. 374.

Hab. Malay peninsula, Sumatra, Borneo, Philippines, Celebes, Java, Sumbawa (*Guillemard*).

a. ♂. Sumbawa.

Iris "pearly"; bill slate-blue at tip, green at base; tarsus pinkish red. Length of wing 14·4 centims.

I am not aware that this species has ever been previously recorded as far eastward as Sumbawa. The example obtained does not diffe in any way from individuals obtained in the Sulu archipelago.

32. SPILOPELIA TIGRINA (Temminck).

Spilopelia tigrina, Salvadori, Ucc. di Born. p. 296; id. Orn. della Pap. iii. p. 151.

Turtur tigrina, Wall. Ibis, 1865, p. 391.

Hab. Nicobars, Malay peninsula, Siam, Sumatra, Borneo, Celebes, Moluccas; Java (*Horsfield*); Lombok (*Wallace*); Sumbawa (*Semmelink*); Flores (*Wallace*); Timor (*Wallace*).

a, b. ♂. Sumbawa town.

c. ♂. Gunong Api Island, Sumbawa.

d. ♀. Gunong Api Island.

Iris light yellow; bill dark slate; tarsus coral. Length of males 34·9, females 30·3 centims. Wing, male 14·0–14·7 centims., female 13·7 centims.

Compared with Celebes and other individuals the present series presents no noticeable differences in plumage, but the yellow iris I have only met with in Sumbawa birds, which latter appear also to be of somewhat larger dimensions than Celebes and Moluccan examples.

33. STREPTOPELIA BITORQUATA (Temminck).

Streptopelia bitorquata, Bp. Consp. ii. p. 65; G. R. Gray, Hand-l. ii. p. 239, sp. 9330; Salvad. Ucc. di Borneo, p. 297; Wall. 1865, p. 391.

Hab. Sumatra, Java, Lombok (*Wallace*); Sumbawa (*Guillemard*); Flores, Timor (*Wallace*).

a–c. ♂. Sumbawa.

Iris orange-yellow; bill blackish; tarsus coral-red. Length 30·0–34·0 centims.; wing 15·3–15·5 centims.

34. GEOPELIA MAUGEI (Temminck).

Geopelia maugei, Bp. Consp. ii. p. 94; Wall. Ibis, 1865, p. 394; Schleg. Mus. Pays-Bas, *Columbæ*, p. 132 (1873).

Hab. Moluccas, Ké Islands, Sumbawa (*Forsten*); Flores (*Wallace*); Timor (*Bernstein*); Wetter and Letti (*Hoedt*).

a. ♂. Gunong Api Island, Sumbawa.

b–e. ♂. Sumbawa.

f, g. Sumbawa.

Iris pale yellow; bill leaden; tarsus ashy blue marked with violet. Length about 24·0 centims.; wing 10·0–10·2 centims.

Extremely common round the town of Sumbawa.

35. CHALCOPHAPS INDICA (Linnæus).

Chalcophaps indica, Salvad. Orn. della Pap. iii. p. 173.

Hab. India, Nicobars, Malay peninsula, Sumatra, Borneo, Philippines, Formosa, Celebes, Moluccas, New Guinea (?), Java (*Horsfield*); Lombok (*Wallace*); Sumbawa (*Forstein*); Flores (*Wallace*).

a. ♂. Gunong Api Island, Sumbawa.
b. Gunong Api Island.

These examples differ from Bornean, Celebean, and Moluccan birds chiefly in having a very broad white superciliary streak.

36. TURNIX POWELLI, sp. nov. (Plate XXIX.)

T. rufilato *affinis; sed hypochondriis et subcaudalibus brunnescentibus, nigro transfasciatis, haud rufescentibus; et abdomine albo, diversus.*

Hab. Gunong Api Island, Sumbawa.
a. ♂. Gunong Api Island, Sumbawa.
b. ♀. Gunong Api Island.
c (♀). Gunong Api Island.

Iris very light yellow; bill, upper mandible brownish, lower greenish yellow; tarsus yellowish green. Length 17·0 centims.; wing 8·6–9·8; bill from gape 2·0 centims.

This Quail, though somewhat resembling *T. rufilatus* of Celebes, is at once recognizable by the entire absence of rufous on the abdomen and thighs. The cervix is darker, the barring on the breast more distinct, and extending much lower; and the black stripe on the throat of the male bird considerably more restricted. I have named this species after my friend Lieut. R. ff. Powell, R.N., who accompanied the 'Marchesa' in her voyages to Kamtschatka and New Guinea.

37. ERYTHRA LEUCOMELANA (S. Müller).

Erythra leucomelana, G. R. Gray, Hand-l. iii. p. 67, sp. 10509.
Amaurornis leucomelæna, Salvad. Orn. della Pap. iii. p. 278.

Hab. Celebes (*Von Rosenberg, Guillemard*); Buru (*Bruijn*); Timor (*S. Müller*); Sumbawa (*Guillemard*).
a. Sumbawa town.

This individual, the label of which is without measurements and notice of colour of soft parts, has the forehead black. The whole of the neck, breast, and abdomen is white, the dark grey being confined entirely to the sides of the body, and not passing towards the middle line of the abdomen as in *E. phœnicura*.

38. ? ARDEOLA LEUCOPTERA (Boddaert).

Ardeola leucoptera, Jerdon, B. Ind. iii. p. 751.
? *Ardeola speciosa*, Horsf. Tr. Linn. Soc. xiii. p. 188.
a. "♀?" Bima, Sumbawa.
b. Juv. ♂. Sumbawa.

Iris, in adult, yellowish; bill greenish black, base of lower mandible greenish yellow; feet and tarsus olive-green.

I have had no opportunity of comparing these skins with Javan or Malaccan examples, and cannot therefore state to which species they should be referred.

3. On a new Pennatulid from the Japanese Sea. By Dr. A. A. W. Hubrecht, C.M.Z.S., Professor of Zoology at the University of Utrecht.

[Received April 30, 1885.]

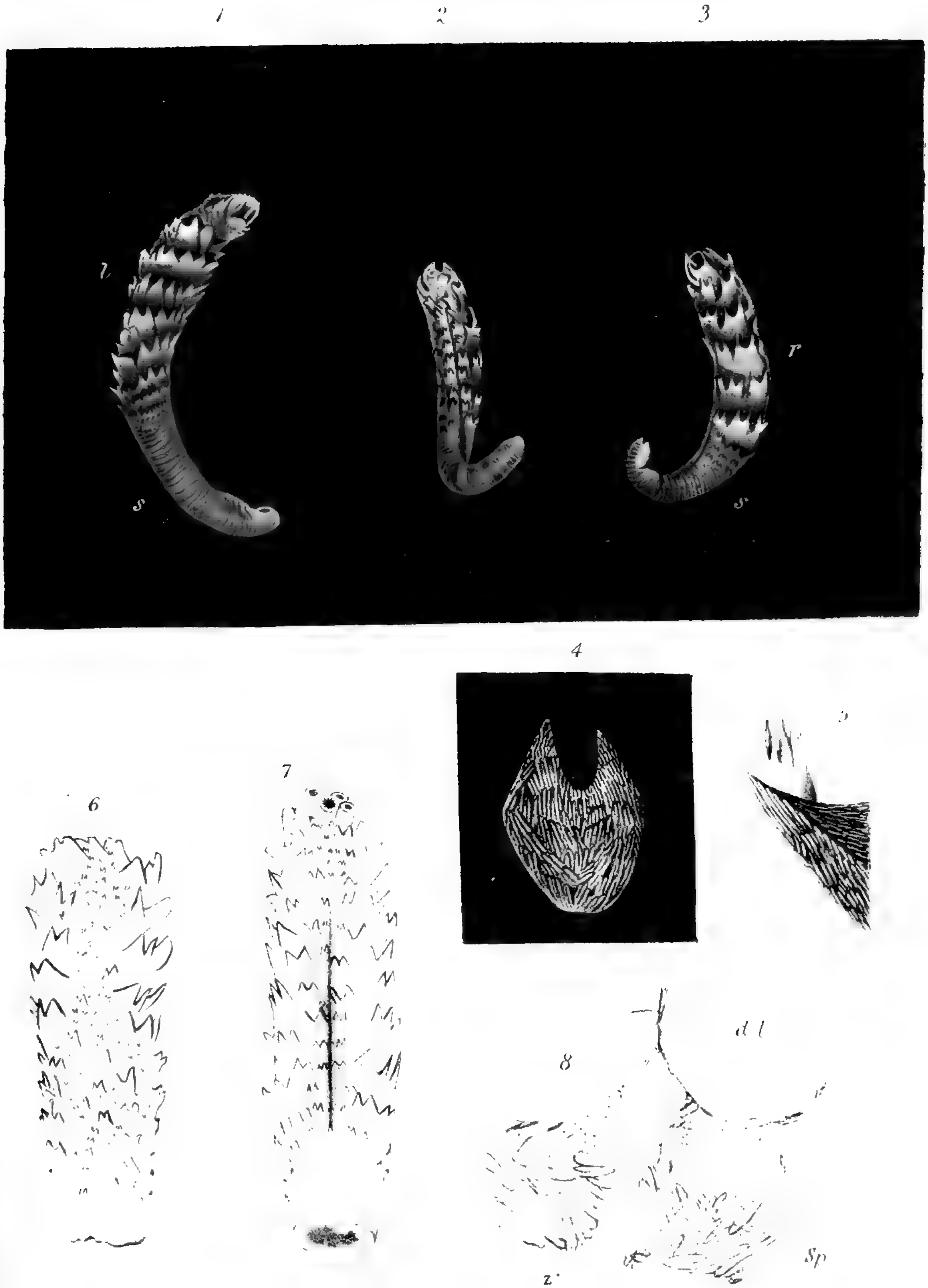
(Plates XXX. & XXXI.)

In the year 1874, Captain St. John, then in the Japanese sea, at 34° 11′ N., 136° 33′ E., captured at a depth of 71 fathoms two specimens of Pennatulids (see Plate XXX. figs. 1–3). They passed into the possession of Professor W. C. MacIntosh of St. Andrews, whose numerous duties and arduous researches in another field of Zoology (Report on the Annelids of the 'Challenger,' &c.) allowed him no leisure to make anything more than a superficial examination of the animals in question. When, in 1884, I had the pleasure of making a short stay at St. Andrews for the purpose of utilizing the numerous facilities offered by the Zoological Station which at the initiative of this distinguished biologist, has arisen at that interesting point of the Scottish coast he kindly showed me over his extremely rich collection of marine invertebrates, mostly in spirit and in excellent state of preservation. We came upon the bottle containing the Japanese specimens, and as I noticed certain distant points of resemblance with Solenogastres, in which I was at the moment particularly interested (presence of calcareous spicules in the integument, club-shaped form, faint longitudinal groove on the concave side, &c.), Prof. MacIntosh most courteously put both the specimens at my disposal for a more detailed anatomical examination.

I was very glad to accept the proposal. This paper contains the result of my investigations, for which, as far as the internal structure is concerned, only one of the specimens (fig. 1) was sacrificed, the other one (figs. 2 & 3) having been returned to the owner intact. Moreover the series of sections which were made through the first specimen were all duly preserved, and are now at St. Andrews.

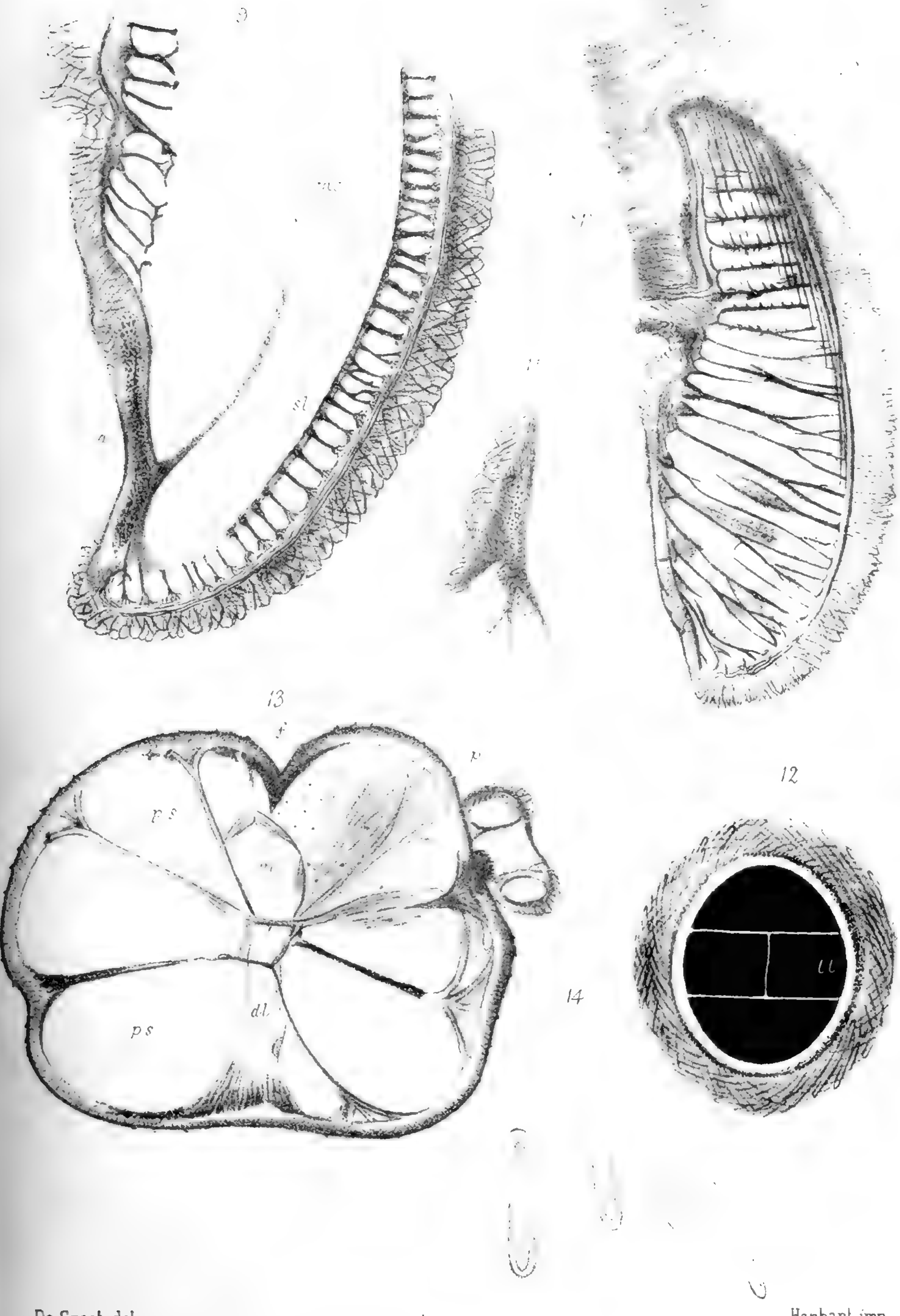
An examination of the two specimens with low power very soon dispelled the possibility of any relationship to the Solenogastres, and showed the organism to be a colony, from which the shrivelled bodies of the polyps with their fringe of long tentacles might be seen to emerge. It was in the thickened portion, the rhachis (*r*), that this was noticed; the stem (*s*) is devoid of polyps and terminates in a rounded knob, which shows a faint swelling just before the lower extremity. Subterminally there was on the concave side a very short oblong furrow, at the bottom of which no opening whatever could be detected.

The colour of both specimens is of the light brownish-red which is reproduced in the figures; and superficial examination revealed the existence not only in the stem, but along the whole rhachis, of delicate calcareous spicules, so densely accumulated as to make the



De Groot del.   Hanhart imp.

ECHINOPTILUM MACINTOSHII



De Groot del. Hanhart imp.

ECHINOPTILUM MACINTOSHII.

whole colony feel hard and rigid when handled. Whereas in the stem these calcareous needles—for such they proved to be on microscopic examination (see fig. 14)—are in no way raised above the common level (faint transverse wrinkles being, however, observable), their aspect on the rhachis is considerably different. Here they unite to form projecting polyp-cells, which have the aspect of shields or scales (figs. 4 & 5), but which merge into the proper surface of the rhachis. These apparent scales are moreover provided with two projecting points, well marked in the different figures, and also wholly consisting of the same needle-like spicules ; whereas they are arranged along the rhachis in what appeared to be faint spirals, ascending from the concave (ventral) side towards the convex (dorsal) one, and directed forwards, *i. e.* towards the extremity of the scaleless stem. Figs. 6 and 7 show that there are no continuous spirals, but that along the median line of the convex surface the rows of large scales are interrupted by a longitudinal band of very minute scales, answering, however, to the same type, but apparently without any projecting polyps, and which, after Kölliker, may well be called zooids (*vide infrà*). At the top of the stem the polyp-cells have not yet acquired the definite and characteristic shape which is indicated in fig. 5. The few which may here be noticed have a more circular, nipple-like aspect; those just below the top are intermediate between the lateral and the top ones.

The characters above enumerated are sufficient to raise a strong suspicion that the colony in question is a Pennatulid. Longitudinal and transverse sections of stem and rhachis will enable us to test this supposition by means of the internal anatomy.

The general impression from a transverse section through the rhachis is this, that the colony is much less massive and solid than the external appearance and the rigidity would lead us to suppose. We notice a spongy arrangement of large-sized spaces, separated by a system of thin septa and trabeculae (figs. 13 & 8), the arrangement of which we shall hereafter have occasion to examine in detail. When touched with the forceps the material that builds up this internal framework is found to be stiff and brittle, and microscopic examination shows that this part of the cœnenchyma is also laden with very numerous calcareous spines (fig. 14), similar in shape to those found in the exterior investment. These spines, though of uniform shape, are of different size. The organic ground-substance in which they are imbedded is moreover stiff and horny, and is dissolved in caustic potash. Together with the calcareous spicules, it gives to the internal framework its rigidity.

In a section through the stem (fig. 12 and woodcut, p. 515, figs. 1 & 2) the arrangement of these septa is seen to be more regular, the free spaces are very symmetrically arranged, and the outer wall is in comparison thicker than in the rhachis.

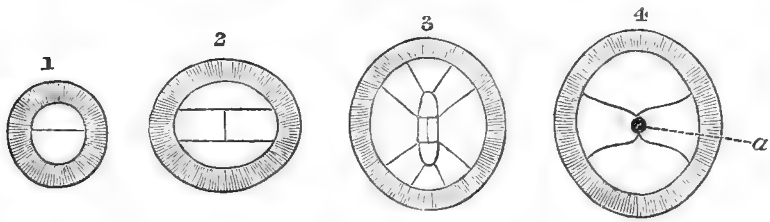
Towards the inferior extremity of the stem there is only one transverse septum, dividing its inner space into a dorsal and a ventral half. This septum is seen in a longitudinal section (perpendicular to its plane) in fig. 9. It appears gradually to split into two parallel septa as we proceed towards the rhachis, a transverse connecting septum, however, keeping up a direct continuity, and being placed perpendicularly to the two parallel ones, and at the same time symmetrically. The internal space is consequently now divided into four spaces instead of two, two lateral spaces having made their appearance in addition to the dorsal and ventral (Plate XXXI. fig 12, and woodcut, p. 515, fig. 2). When we examine the figures in Kölliker's monograph ('Anatomisch-systematische Beschreibung der Alcyonarien, I. Pennatuliden,' plate x. fig. 78 ; plate xiv. figs. 107–113 ; plate xxi. fig. 180 ; plate xxiii. fig. 212) of sections through the stems of different genera of Pennatulids, we find that there, too, a similar arrangement of the septa and the spaces obtains, and that towards the inferior extremity of the stem the spaces are also reduced to two. One remarkable difference to be noticed in our specimen is this, that whereas in the other Pennatulids an axis of more or less considerable size and massive consistency appears and is situated in the median vertical septum above alluded to (*cf.* Kölliker's figs. 78, 108, 110, 212), *such an axis is entirely absent in Echinoptilum,* no trace of it being found either in the stem, the lower part of the rhachis, or its upper portion. The septum in which it is always developed is there, however, as was just noticed.

We must now observe that in the rhachis the dorsal, ventral, and lateral spaces which we have been describing for the stem, and which are here so symmetrically placed, are none the less present throughout the whole of the rhachis, but are here reduced in size by the development of spaces exteriorly to them, in which the polyps will partly be lodged. Fig. 13 gives a satisfactory representation of this arrangement. It is a section in the lower third of the rhachis, and shows us the two parallel septa with the perpendicular one between them, situated in the axis of the rhachis, and at the same time the four spaces which they help to enclose, uninterruptedly continued from the stem into the rhachis, their bulk being, however, not inconsiderably reduced.

At the top of the rhachis they disappear, transverse sections showing that they only reach so far as close to the top, but that at the very extrem[illegible] [illegible]ly the additional spaces *ps* belonging to the termi[illegible] [illegible]is are present; this would to a certain extent bring o[illegible] another point of comparison between the septa here discussed and those carrying the axis in other Pennatulids, the latter structure being known not to attain the topmost extremity of the polyparium, but to stop short close to the top of the rhachis. The accompanying woodcut (p. 515) exemplifies diagrammatically the arrangement of the primitive spaces in transverse sections of different regions of the polyparium. For comparison fig. 4 is copied from Kölliker.

Returning now to the base of the stem, we note in longitudinal sections (fig. 9) that here the short median, ventral, and subterminal furrow, already mentioned above when reviewing the external characters of the specimen, is indeed a depression in the integument, and that at the bottom of this depression a flat expansion of the sclerenchyma separates the cavities of the hollow stem from the exterior. This expansion, which was characterized by its more brownish-yellow colour from the rest of the red polyparium, is now seen to owe this different coloration to the absence of spicules in this part; the spicules are seen to diminish in size in the vicinity of the disk (fig. 9), several of them being yet imbedded in its circumference, but none in its central portion. The gradual passage of this sclerenchymatous tissue into the rest of the investment of the polyparium is more clearly visible in the adjacent longitudinal section. It may be further gathered from the figures 10 & 11, the former figure at the same time serving to demonstrate both the directions in which the spiculæ are placed in the wall of the stem, and the more or less complicated trabecular arrangement of the sclerenchyma, as it is found inside the outer spicule-bearing layer and surrounding the spaces in the stem.

I have, finally, to mention numerous pores by which the walls of



Figs. 1–3. *Echinoptilum macintoshii.* 1. Transverse section of lower part of stem. 2. Ditto of upper part of stem. 3. Ditto of rhachis.
Fig. 4. *Cavernularia lütkenii.* transverse section of lower part of rhachis (after Kölliker, *l. c.* pl. 23); *a*, axis.

the polyparium are perforated, and which in transverse sections are found to correspond to the small zooids. From this it follows, and the sections moreover entirely corroborate the conclusions, that these pores are more numerous on the dorsal surface (*cf.* fig. 6) than elsewhere. One of these pores is represented magnified and in transverse section in fig. 8. Remains of polyps could in my specimen not be detected in the cavities into which these pores lead; still from analogy I feel justified in calling the external small polyp-cells corresponding to these openings, zooids. After having th[illegible] our attention to the external and internal characters of the polyparium, we should have to examine the soft tissues, the polyps themselves, the reproductive apparatus, &c. Unfortunately the one specimen I felt justified in dissecting has hardly anything to teach us in that respect. The remnants of the polyps extruding from their polyp-cells were well visible even with a hand-glass, upon superficial examination of the specimen, and even a number of long tentacles could be seen to belong to each of the polyps. They had, however, so flat and shrivelled an appearance that I was doubtful whether they would give any histological information when sectionized. My doubts were realized, and I have come to the conclusion that since 1874, when the polyparia were captured, they must have gone through a phase of desiccation, although when I received them they were in spirit. This would also explain how it was that internally all traces of cell-structure had vanished, that no staining methods were of any use, &c. Careful preparations of parts of the rhachis-wall spread out and looked at from the inside, showed that the polyparia indeed contained polyps (and that the zooids did not), moreover showed remnants of the mesenterial filaments, but how the internal soft parts were respectively related could not possibly be made out. I must leave this to a more fortunate student of specimens in the fresh state.

There only remains for us to inquire whether the structure of the polyparium, as we have described and partly figured it, will enable us to decide about the degree of relationship which the new genus, proposed to be called *Echinoptilum*, has to the other genera and groups of Pennatulids.

It is undoubtedly amongst the less specialized families of Seapens that we must look for its nearest allies; and were it not for the incipient differentiation of a dorsal and ventral surface, and more especially for what sections teach us in this respect, we should feel inclined to arrange *Echinoptilum* in the very lowest section—the Veretilleæ, which, by the radial arrangement of the polyps round the rhachis, still more closely approach the Alcyonaria s. str. (*Alcyonidæ* &c.). For the reasons just recalled to mind we have, however, to arrange the new genus in Kölliker's other large section, that of the Spicatæ, which is characterized by a bilateral arrangement of the polyps on the rhachis. In this section the less differentiated families of the Kophobelemnonidæ and the Protoptilidæ have several structural peculiarities in common with *Echinoptilum*; and the new genus of Protoptilidæ, *Gunneria*, only very lately described by Danielssen and Koren[1], more especially resembles *Echinoptilum* in its very massive development of needle-like calcareous elements in the sarcosoma. Moreover the external appearance of the individual polyp-cells in *Echinoptilum* and the arrangement of the spicules in the wall of these is met with in other Protoptilidæ.

The general aspect of *Echinoptilum*, its shortness and club-shape, more especially resembles that of *Kophobelemnon*, the Protoptilidæ being long and slender, and their polyparia reminding one of the unbranched Gorgonidæ. The calcareous needles also are very profusely represented in the investment of the Kophobelemnonidæ, but are not found in the internal delicate framework of this family, whereas, on the contrary, in *Echinoptilum* we find it thickly beset with them. Again, the individual polyp-cells of the Protoptilidæ have more resemblance to *Echinoptilum* than those of *Kophobelemnon*, where they are much less marked and projecting.

On the other hand, we must not lose sight of the fact that with another section of the Spicatæ, viz. the Funiculineæ, *Echinoptilum* has also more than one point of comparison, more especially with Kölliker's new genus *Stachyptilum* ('Challenger' Reports, vol. i. Pennatulids, p. 12, pl. viii. figs. 24–26). The polyp-cells in *Echi-*

[1] Der Norske Nordhavs Expedition, xii. Zoology, Pennatulida: Christiania, 1884.

noptilum are, however, less regularly arranged in distinct rows, the ventral surface is not in the same way wholly devoid of polyps &c. This is another reason for assigning a not unimportant intermediate position to the new genus.

Echinoptilum will best be placed in Kölliker's section Spicatæ, subsection Junciformes (*l. c.* 'Challenger' Reports), and in that subsection it must form a new family, that of the Echinoptilidæ, characterized by the important fact of the total absence of anything resembling an axis, present in all other Pennatulidæ with the exception of certain species of the most primitive section, the Veretilleæ. In the very divergent section of the Renilleæ also an axis is absent.

The fact that certain species of *Veretillum* and of *Cavernularia* (another Veretillid) have an axis, whereas others of the same genus have not, is no argument to disqualify the new family; as it must be borne in mind that this degree of variability is only exhibited by species of the most primitive section of the Pennatulids, in which the axis may well be said to make its first appearance, being insignificant and of variable dimensions in *Veretillum cynomorium*, *Cavernularia glans*, and *Cavernularia lütkeni*. Its total absence in the Renilleæ also tends to prove that in the original stock from which the Pennatulids have sprung an axis was absent. This section is characterized by Kölliker (*l. c.* 'Monographie der Alcyonarien,' 1872, p. 263) as "very different from the other Pennatulids in its possession of a more simple internal structure," and related to the lowest Veretillidæ. It is thus the more remarkable to find an axis to be totally deficient in the new genus, which already so clearly shows points of agreement with those groups that are generally recognized as more highly developed, and in which an axis is present—sometimes even very strong and massive—without a single exception.

EXPLANATION OF THE PLATES.

Plate XXX.

Fig. 1. First specimen of *Echinoptilum macintoshii*, lateral view, enlarged about $1\frac{1}{2}$ times: *l*, rhachis; *s*, stem.

2 & 3. Second specimen of the same, seen from below (2) and in lateral perspective (3), enlarged $1\frac{1}{2}$ times: *r*, rhachis; *s*, stem.

In fig. 1 the median ventral depression at the lower extremity of the stem is visible; in figs. 2 and 3 the median ventral furrow on the rhachis.

4. Front view of a polyp-cell and its calcareous spicules, more considerably enlarged.

5. Lateral view of the same. The polyp represented as emerging from the cell is entirely imaginary, and only meant to indicate the position of the opening in the cell.

6. Dorsal, and Fig. 7 ventral, view of the rhachis of specimen fig. 1, exactly reproducing the position of polyp-cells and zooids on these two surfaces. The ventral furrow on the lower part of the rhachis is plainly visible in fig. 7.

8. Part of a transverse section, intended to show the perforation of the wall of the polyparium *z*, corresponding to a zooid. *d l*, the longitudinal dorsal channel; *sp*, spicules in the integument.

PLATE XXXI.

Fig. 9. Longitudinal median dorso-ventral section through the inferior extremity of the stem: *ms*, median septum, dividing the inner cavity into a dorsal and ventral channel.
10. Section of the same series, but more lateral: *sp*, calcareous spicules.
11. Direct continuation of the terminal disk *a* into the sclerenchyma *sl* (fig. 9).
12. Transverse section through the middle of the stem. Appearance of two additional lateral channels, *ll*.
13. The same through the lower portion of the rhachis: *dl*, dorsal, *vl*, ventral channel; *p*, polyp-cell with two internal supports; *f*, ventral furrow; *p.s*, radially situated spaces.
14. The red-coloured calcareous spicules.

4. Descriptions of new Species of Lepidoptera Heterocera, chiefly from South America. By HERBERT DRUCE, F.L.S., F.Z.S., &c.

[Received May 4, 1885.]

(Plates XXXII. & XXXIII.)

The following descriptions are all taken from specimens in my own collection. They mostly relate to species brought home by Mr. C. Buckley from Ecuador; to these I have added descriptions of some recent acquisitions from various localities.

AGARISTIDÆ.

EUSEMIA, Dalman.

EUSEMIA OPHELTES, sp. n.

Primaries deep black with a metallic streak across the middle of the cell, and a second wider streak on the discocellulars; the outer margin from the apex to the anal angle broadly banded with snow-white: secondaries glossy deep blue, in some lights shot with greenish reflections; the outer margin broadly banded with white from the apex to the inner margin; the underside the same as above. Thorax and abdomen bluish black; collar white; head and antennæ black; palpi and under front of thorax bright orange.

Expanse $3\frac{1}{4}$ inches.

Hab. North Burmah.

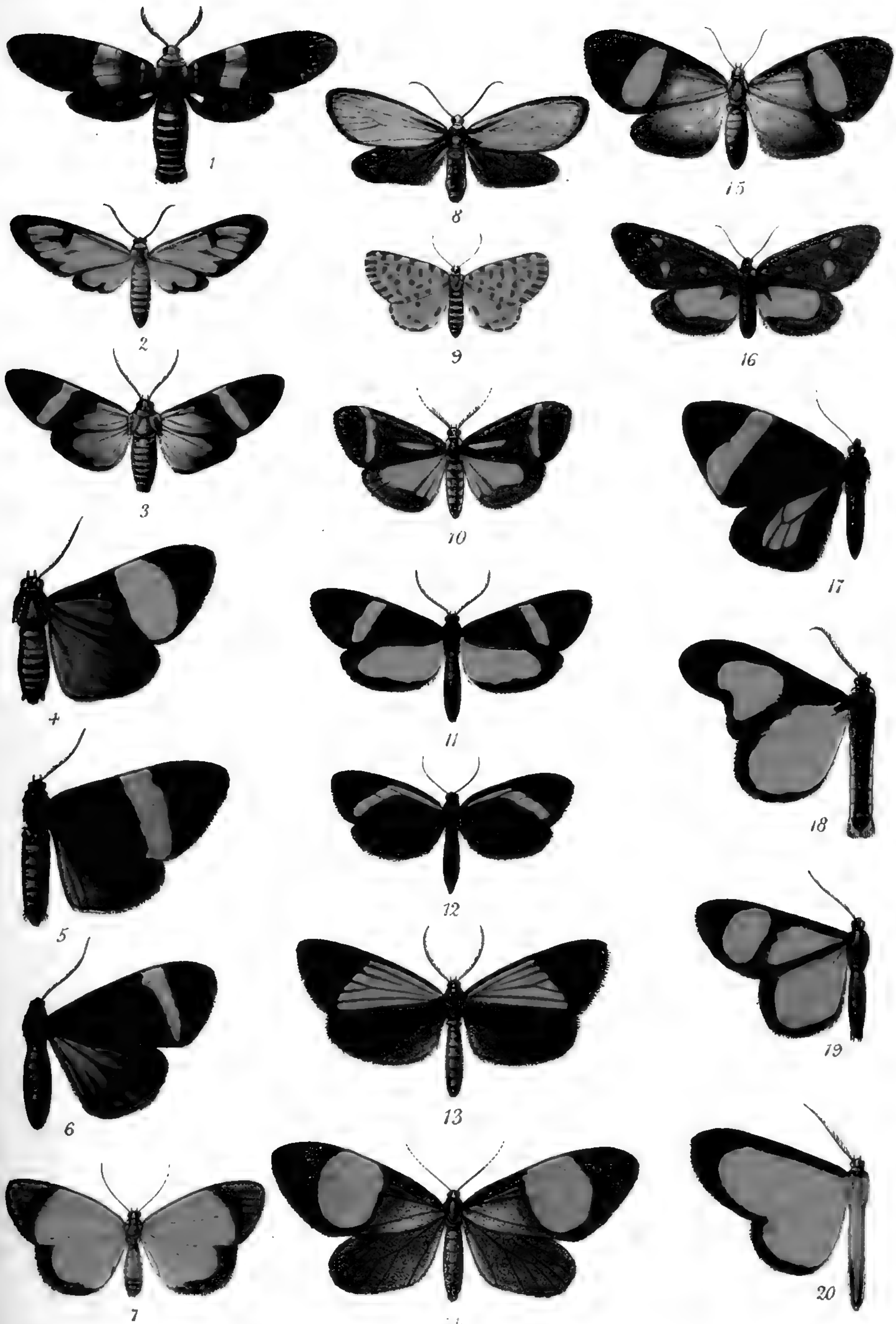
This grand insect belongs to the *E. albomarginata* group of *Eusemia* and comes nearest *E. fimbriata*, Boisd., from which it is at once distinguished by the broad snow-white margins to the wings.

CHALCOSIIDÆ.

AMESIA, Westwood.

AMESIA HYALA, sp. n.

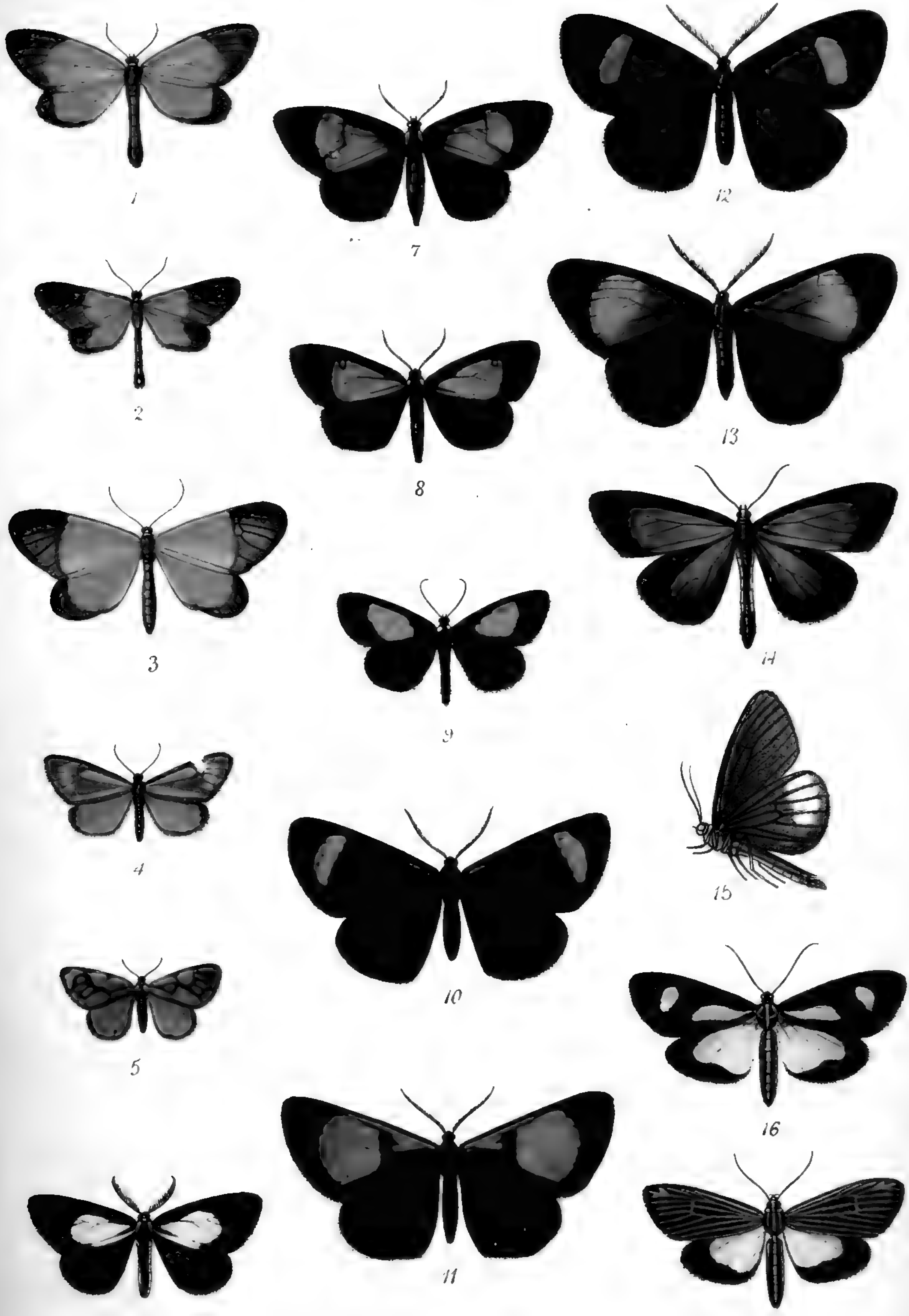
Primaries uniform dark brown, with eight white spots beyond the cell, placed the same as in *A. euplocoides*, but without the blue spots on the costal margin and at the base as in that species; the extreme ends of the nerves on the outer margin marked by a few



W Purkiss lith

Hanhart imp.

NEW LEPIDOPTERA HETEROCERA



W Purkiss lith. Hanhart imp.

NEW LEPIDOPTERA HETEROCERA.

dusky white scales: secondaries uniform dark brown, with two blue spots in the middle of the cell, and just beyond the end of the cell three small white dots; the tips of the nerves along the outer margin from the apex to near the middle dusky white. The underside the same as above, but the spots are more distinct. Head, thorax, and abdomen brownish black; legs black; antennæ wanting.

Expanse 4 inches.

Hab. N. India, Darjeeling.

This species is allied to *A. euplocoides* and *A. stelligera*: from the former it is at once distinguished by the entire absence of the creamy white of the secondaries; from the latter by wanting the marginal row of white spots to both wings and being without the blue marginal band.

ZYGÆNIDÆ.

SYNTOMIS, Ochs.

SYNTOMIS GEON, sp. n. (Plate XXXII. fig. 2.)

Primaries pale chrome-yellow; the costal apex and outer margin bordered with black, on the inner edge very much dentated; a black band at the end of the cell joining a small oval-shaped black spot about the middle: secondaries chrome-yellow, narrowly bordered with black on the outer margin. Front of head, collar, and tegula bright yellow; back of head and thorax black; abdomen yellow, banded with black; anus black; antennæ black, tipped with white; legs black.

Expanse $1\frac{1}{4}$ inch.

Hab. Philippine Islands, Mindanao (*Semper*).

CHARIDEA, Dalman.

CHARIDEA MARIAMNE, sp. n. (Plate XXXII. fig. 3.)

Primaries deep black, with the basal half brilliant morpho-blue, crossed from the middle of the costal margin to near the anal by a narrow bright orange band: secondaries brilliant blue, broadly margined with black at the apex; head, thorax, and abdomen bright metallic blue; the underside of abdomen with a central white streak. Antennæ, palpi, and legs black.

Expanse $1\frac{1}{4}$ inch.

Hab. Colombia, Bogotá.

This beautiful little species is quite unlike any known to me, and it is one of the most brilliantly coloured insects belonging to this genus.

MYDRODOXA, Butler.

MYDRODOXA SEMPERI, n. sp. (Plate XXXII. fig. 1.)

Primaries glossy greenish black, crossed from the costal to the inner margin by a bright metallic golden-yellow band, a row of metallic blue spots close to the base: secondaries glossy black, with an oval hyaline central spot between the costal and inner margin. Head, collar, and front of the thorax bright carmine; thorax and abdomen black, the abdomen speckled with golden-yellow scales; antennæ and legs black; wings below black, tipped and speckled with bright green.

Expanse $1\frac{3}{4}$ inch.

Hab. Philippine Islands, Luzon (*Semper*).

This fine species is very distinct from any with which I am acquainted, its nearest ally being *M. splendens*, Butler, from Madagascar.

Pericopidæ.

Eucyane, Hübner.

Eucyane childon, sp. n. (Plate XXXII. fig. 4.)

Primaries (♂) bluish black, much shot with dark blue from the base to about the middle; a wide orange-coloured band crossing the wing from the costal margin to the anal angle, but not quite reaching the inner margin: secondaries rich bluish black, almost black at the apex. Head and thorax black; abdomen above deep glossy blue, below dark chrome-yellow; antennæ black; legs brownish black. Wings below the same as above, with a submarginal row of bluish-white spots, small in the male but distinct and well defined in the female: in all other respects the female is the same as the male, but slightly larger.

Expanse, ♂ $1\frac{3}{4}$, ♀ 2 inches.

Hab. Ecuador, Sarayacu (*Buckley*).

This handsome species reminds me of *Agarista lethe*, Felder. Mr. Buckley obtained a fine series of specimens of this insect.

Eucyane phlegon, sp. n. (Plate XXXII. fig. 5.)

Primaries (♂) deep black, shot with dark blue, crossed beyond the middle by a bright carmine band; secondaries deep glossy blue-black. Head, thorax, and abdomen black, shot with dark blue; underside the same as above. Antennæ and legs black. The sexes are alike.

Expanse ♂ 2, ♀ $2\frac{1}{10}$ inches.

Hab. Ecuador, Sarayacu (*Buckley*).

This beautiful species is most nearly allied to *E. jucunda*, Felder, from which it is at once distinguished by the absence of the red spot on the secondaries, and the much less bright blue colour of the wings.

Eucyane chesalon, sp. n.

Primaries brownish black, crossed by a carmine band; the nerves pale brown; secondaries very dark brown, almost black in some lights. Head, thorax, and abdomen dark brown; antennæ and legs black.

Expanse $1\frac{1}{2}$ inch.

Hab. Ecuador, Sarayacu (*Buckley*).

The primaries of this species are coloured almost the same as *E. amica*, Cr., but the entire absence of the red marginal band on the secondaries at once shows that it is a very distinct species.

EUCYANE SIMSONI, sp. n.

Primaries brownish black, glossed with dark blue near the base, and crosssed from about the middle of the costal margin to the anal angle by a bright carmine band edged on either side with a narrow row of pinkish-white scales; the band is widest on the costal margin: secondaries brown, glossed with very dark blue; the outer margins broadly bordered with carmine. Head and front of thorax bright carmine; abdomen very dark glossy blue; antennæ and legs brownish black. The wings below are the same as above.

Expanse $3\frac{3}{4}$ inches.

Hab. Colombia, Aguano (*Simson*); Ecuador, Sarayacu, Bolivia (*Buckley*).

The first specimen I received of this grand insect was sent home by Mr. Simson, who obtained it and many other fine species at Aguano; since that time I have received several specimens, taken in Ecuador and Bolivia, by Mr. Buckley, who states that its flight is very swift. The example from Bolivia differs from all the others: the band of the primaries is narrower, and the colour of that and the outer margins of the secondaries is pale pink instead of bright carmine. It is quite probable that it may belong to another species, but without more material I do not feel certain upon that point.

EUCYANE CHISLON, sp. n.

Primaries dark brown, crossed from the middle of the costal margin to the anal angle by a narrow chrome-yellow band, widest at the costal margin: secondaries uniform dark brown. Underside the same as above except that both wings have a submarginal row of bluish-white spots. Head and thorax dark brown, spotted with white in front; abdomen brown on the upper side, shot with dark glossy blue, the underside bright chrome-yellow; legs dark brown; antennæ and palpi black.

Expanse $2\frac{1}{4}$ inches.

Hab. Ecuador, Intaj (*Buckley*).

This species closely resembles *Agarista lethe*, Felder, in colour.

COREURA, Walker.

COREURA SALMONI, sp. n. (Plate XXXII. fig. 6.)

Primaries dark brownish black, crossed beyond the middle from the costal margin to near the apex, but not quite reaching the inner margin, by a dark red band, in some lights glossed with blue: secondaries dark blue, with the nerves, outer and inner margins dark brown. Wings on the underside the same as above, except that the primaries are dark blue from the base to the red band. Head, thorax, and abdomen dark brown; antennæ, palpi, and legs black.

Expanse $1\frac{3}{4}$ inch.

Hab. Colombia, Antioquia, Frontino (*Salmon*).

This beautiful species is very distinct, but comes nearest *Coreura euchromoides*, Walker.

Hyalurga, Hübner.

Hyalurga caralis, sp. n.

Primaries whitish hyaline, more so near the apex; the costal, outer, and inner margins broadly bordered with black; a band crossing the wing from the costal margin beyond the cell to the anal angle, and all the nerves black; a narrow reddish-brown streak from the base on the costal margin to about the middle of the cell, and a reddish line from the middle of the inner margin reaching the apex, and then extending a little way along the outer margin: secondaries hyaline; the nerves all black; the outer margin bordered with black enclosing a narrow reddish line. Head and front of thorax black, with four white spots in front; thorax black, with two large bluish-white spots at the base. Abdomen brownish black above, with two almost central, rather wide, bluish-white bands extending from the base to the anus, also one on each side; the underside dirty white. Antennæ, palpi, and legs black.

Expanse $2\frac{3}{4}$ inches.

Hab. Ecuador, Intaj (*Buckley*).

This fine species is quite distinct from any other.

Hyalurga? puhites, sp. n.

Primaries semihyaline, thickly speckled with black scales, the costal, outer, and inner margins bordered with black, very broadly at the apex; a black band crossing from the costal margin beyond the middle and extending to the outer margin just above the anal angle, enclosing a large oval white spot crossed by the black nerves: secondaries greyish hyaline, with the outer margin narrowly bordered with black, broadest at the anal angle; the nerves all black, with black scales on each side, the fringe white. Head and collar pale yellow; thorax and abdomen brown, with a central bluish-white line, the underside of the abdomen dusky white; anus bright orange; legs brown; antennæ black; palpi bright yellow.

Expanse $2\frac{1}{2}$ inches.

Hab. Upper Amazons (*Whitely*).

Phaloë, Guérin.

Phaloë pyste, sp. n.

Primaries dark brown, crossed beyond the middle by two yellowish hyaline bands as in *P. cruenta*, a broad yellowish hyaline band extending from the base along the inner margin almost to the anal angle, and a submarginal row of white spots: secondaries yellowish hyaline, the costal and inner margin thickly speckled with chrome-yellow scales, the outer margin broadly bordered with dark brown and a submarginal row of small white dots. Underside the same as above, excepting that the costal margins of both wings are dark chrome-yellow at the base, and the submarginal row of white spots are larger. Head and thorax black, thickly speckled with small white spots; abdomen above pale brown, on the underside dusky white, a narrow yellow and black line on each side; legs brownish white; antennæ and palpi black.

Expanse $2\frac{3}{4}$ inches.

Hab. Ecuador (*Buckley*).

This species is most nearly allied to *P. cruenta* and *P. lorzæ,* but it can at once be distinguished from either of them by the entire absence of the red spots on the primaries, besides which there are many other differences.

Pericopis, Hübn.

Pericopis irene, sp. n.

Primaries dark brown, slightly yellowish near the base; a pale yellow band crosses the wing from about the middle of the costal margin to the anal angle, and a submarginal row of minute white spots: secondaries with the basal half pale chrome-yellow, the outer half dark brownish black, crossed from the inner margin near the anal angle to the apex by a band of irregular orange-coloured spots and a submarginal row of white spots. Head and thorax black, spotted with yellow; abdomen above yellowish brown, with a central black line, on the underside yellow; legs brown.

Expanse 3 inches.

Hab. Paraguay (*Bates*).

This species is nearest to *P. isse,* from which it is at once distinguished by having only one yellow band crossing the primaries instead of two as in that species, the band nearest the apex being entirely absent, and also by the submarginal row of white spots to both wings.

Pericopis phyleis, sp. n.

This species is allied to *P. phœba* and *P. ithrana*; but from both it differs in being without the row of spots near the apex of the primaries, and in the almost entire absence of the submarginal row of spots, one only remaining in the middle of the wing close to the outer margin; the yellow band at the end of the cell is smaller and paler-coloured, the base of the wing to near the middle is bright orange-red, extending in streaks almost to the yellow band at the end of the cell: the secondaries are dark brown, streaked with bright orange-red from the base to the outer margin. Head and thorax black, spotted with yellow dots; abdomen reddish brown; legs black.

Expanse $3\frac{1}{4}$ inches.

Hab. Ecuador, Sarayacu (*Buckley*).

This fine species very closely resembles *Heliconius bartletti.* Mr. Buckley obtained a fine series of this insect; all the specimens are before me and do not show any variation.

Lithosiidæ.

Josioides, Felder.

Josioides sibyllæ, sp. n. (Plate XXXII. fig. 7.)

Primaries and secondaries chrome-yellow, the apical third of the primaries brownish black, darkest on the inner margin where it joins on to the yellow; secondaries broadly bordered with black. Head, antennæ, and palpi black; thorax and abdomen dusky yellow; legs pale brown.

Expanse $1\frac{1}{2}$ inch.

Hab. Ecuador, Sarayacu (*Buckley*).

A pretty little species, not nearly allied to any with which I am acquainted.

PTYCHOGLENE, Felder.

PTYCHOGLENE SPLENDIDA, sp. n. (Plate XXXII. fig. 8.)

Primaries very bright green shot with blue, almost metallic, the costal and outer margins narrowly bordered with black; secondaries black, semihyaline. Head, thorax, and abdomen bright metallic green; antennæ black, tipped with white; legs black shot with green.

Expanse $1\frac{1}{2}$ inch.

Hab. Ecuador, Chiguinda (*Buckley*).

One of the most beautiful species brought home by Mr. Buckley, to some extent reminding me of *Inopsis catoxantha*, Felder. I place this species in the genus *Ptychoglene* with considerable doubt.

EUDULE, Hübner.

EUDULE SICELIDES, sp. n.

Primaries and secondaries uniform dark red, with the outer margins of both wings narrowly bordered with black. Head and thorax red; abdomen black; antennæ, palpi, and legs black; the underside of the wings the same as above, but rather paler in colour.

Expanse $1\frac{1}{10}$ inch.

Hab. Bolivia (*Buckley*).

This species is allied to *E. sanguinea*, Butler; but it is a larger insect, darker in colour, without any red on the abdomen, which is quite black below instead of whity brown.

EUDULE TRITONIA, sp. n. (Plate XXXII. fig. 9.)

Primaries and secondaries orange-yellow; primaries thickly spotted with greenish-black dots, and a series of short streaks of the same colour along the outer margin, in some specimens more distinct than in others: secondaries with a marginal and submarginal row of minute greenish-black dots, a short black streak on the inner margin about the middle, and a black dot at the end of the cell. Head, thorax, abdomen, and antennæ black, the abdomen banded with white; the legs brownish black.

Expanse 1 inch.

Hab. Ecuador, Sarayacu (*Buckley*).

A very beautiful little species, quite distinct from any other with which I am acquainted.

MELAMERIDÆ.

BEPARA, Walker.

BEPARA CHIGUINDA, sp. n. (Plate XXXII. fig. 10.)

Primaries brownish black, crossed beyond the cell by a narrow yellow band dentated on the inner edge, a narrow streak extending from the base to near the end of the cell pale yellow : secondaries chrome-yellow, broadly bordered with brownish black. Head, thorax, and the upper side of the abdomen black, the sides yellow ; antennæ black.

Expanse $1\frac{1}{4}$ inch.

Hab. Ecuador, Chiguinda (*Buckley*).

I feel doubtful if this species should be placed in the genus *Bepara* ; in many points it is the same, in others it is not ; but only having a few specimens I am unable to decide this point with certainty. Mr. Buckley only met with this species on one occasion.

Lyces, Walker.

Lyces fornax, sp. n. (Plate XXXII. fig. 11.)

Primaries deep black, crossed in the middle from the costal margin to the inner margin near the anal angle by a narrow chrome-yellow band ; secondaries bright chrome-yellow, with a narrow black outer margin, widest at the apex. Head, antennæ, thorax, and abdomen black ; legs black ; underside the same as above. The female the same as the male, but slightly larger in size.

Expanse, ♂ $1\frac{1}{2}$ inch, ♀ $1\frac{3}{4}$ inch.

Hab. Ecuador, Intaj (*Buckley*).

This species is allied to *Lyces angulosa*, Walker, from South-east Brazil.

Scea, Walker.

Scea fluonia, sp. n. (Plate XXXII. fig. 12.)

Primaries deep black ; a narrow curved, pale, yellow band crossing the wings from the base along the costal margin to about the middle, then crossing to near the anal angle ; secondaries deep black. Head, antenæ, thorax, and abdomen black ; legs black ; the underside of wings the same as above.

Expanse $1\frac{1}{4}$ inch.

Hab. Ecuador, Chiguinda (*Buckley*).

This little species is very distinct from any that I am acquainted with. Mr. Buckley only obtained it at Chiguinda.

Scea orilochia, sp. n.

Primaries slate-black, with the basal half orange, the nerves black ; secondaries black. Thorax, abdomen, legs, head, and antennæ deep black ; the underside the same as above.

Expanse $1\frac{1}{4}$ inch.

Hab. Ecuador, Chiguinda (*Buckley*).

A very pretty little species, allied to *S. auriflama*, Hübner, from South-east Brazil.

Scea cleonica, sp. n. (Plate XXXII. fig. 13.)

Primaries citron-yellow from the base to beyond the middle, the apex broadly banded with black, the nerves and inner margin black :

secondaries uniform black. Head, thorax, and abdomen dull black. Antennæ of the male deeply pectinated, of the female simple. Legs black. The underside the same as above, except that the legs are not black.

Expanse, ♂ $1\frac{1}{2}$ inch, ♀ $1\frac{3}{4}$ inch.

Hab. Ecuador, Chiguinda (*Buckley*).

This insect is allied to the preceding species, from which it is easily distinguished by the much paler colour of the primaries, larger size, and more robust appearance.

Actea, Walker.

Actea minuta, sp. n.

Primaries deep black, with an elongated oval yellow band beyond the middle between the costal and the anal angle, but not reaching the outer margin ; a narrow yellow streak extending from the base along the costal margin to about the middle ; secondaries deep yellow, margined with black. Head, antennæ, thorax, and abdomen black, the base and sides of the abdomen banded with yellow.

Expanse $1\frac{1}{4}$ inch.

Hab. Ecuador, Sarayacu (*Buckley*).

This little species is very distinct from all others with which I am acquainted.

Darna, Walker.

Darna unifasciata, sp. n. (Plate XXXII. fig. 14.)

Primaries slightly hyaline, slaty black, with a wide orange-coloured band crossing from the costal margin to near the inner margin, the inner end of the band being rounded ; the wing from the base to the red band is shot with pale grey: secondaries uniform hyaline black ; the underside the same as above. Head, thorax, and abdomen black shot with bluish grey ; antennæ and legs black.

Expanse 2 inches.

Hab. Ecuador, Intaj (*Buckley*).

This insect is very distinct from any other with which I am acquainted. Mr. Buckley only met with this species at Intaj.

Darna imperialis, sp. n. (Plate XXXII. fig. 15.)

Primaries black, shot with bright blue from the base to the middle, where a narrow yellow band crosses from the costal margin to near the anal angle, but not reaching the outer or inner margin : secondaries bright blue, bordered with black. Head, palpi, and antennæ black ; thorax and abdomen bright glassy blue above, on the underside brownish black.

Expanse $1\frac{3}{4}$ inch.

Hab. Ecuador, Chiguinda (*Buckley*).

This beautiful species is allied to *D. colorata*, Walk., from which it is at once distinguished by the narrow yellow band on the primaries and also in several minor points.

DARNA TRIPUNCTATA, sp. n. (Plate XXXII. fig. 16.)

Primaries brownish black, with three orange-coloured spots, the first small and near the base, the second at the end of the cell, the third below it close to the inner margin: secondaries bright orange, broadly bordered with brownish black from the apex to the anal angle, the base slightly brown, the underside the same as above. Head, thorax, and antennæ black, tegulæ streaked with yellow; palpi, antennæ, and legs black.

Expanse $1\frac{1}{2}$ inch.

Hab. Ecuador, Sarayacu (*Buckley*).

HAGNAGORA, Druce[1].

HAGNAGORA BUCKLEYI. (Plate XXXII. fig. 17.)

Primaries rich dark brown, crossed from the middle of the costal to the outer margin near the apex by a dark orange-red band; secondaries dark purple-blue, broadly bordered with dark brown. Underside of the primaries the same as above, but the orange band rather paler in colour; secondaries brown, streaked between the nerves with bright blue. Head, thorax, and abdomen brownish black; antennæ black; legs brown.

Expanse $1\frac{3}{4}$ inch.

Hab. Ecuador, Intaj (*Buckley*).

A very beautiful insect, allied to a new species from Nicaragua.

HAGNAGORA LEX, sp. n.

Primaries dull brown, crossed from the costal margin to the anal angle by a narrow orange-coloured band; secondaries uniform brown. Underside the same as above, except that the secondaries have several silver streaks near the inner margin. Head, antennæ, thorax, and abdomen dark brown.

Expanse $1\frac{3}{8}$ inch.

Hab. Ecuador, Sarayacu (*Buckley*).

A small dull-coloured insect, quite distinct from the preceding and also the Central-American species.

JOSIA, Hübner.

JOSIA GLYCERA, sp. n.

Primaries deep orange, narrowly bordered with black, resembling *J. ligula* but with the black borders much narrower: secondaries bright orange, with the costal margin and apex broadly bordered with black, and with a black Λ-shaped mark at the anal angle. Head, antennæ, and thorax black; collar and tegulæ yellow; abdomen black, with the base and sides banded with orange-yellow; legs black.

Expanse 1 inch.

Hab. Colombia, Manaure (*Simons*).

This insect is allied to *J. ligula*, from which it differs greatly in the markings of the secondaries.

[1] The description of this genus will shortly be published in the 'Biologia Centrali-Americana.'

JOSIA ORIBIA, sp. n.

Form of *J. auriflua*, Walk. Primaries deep orange-yellow, with the margins narrowly bordered with black; secondaries orange-yellow, with the costal, outer, and inner margins narrowly bordered with black. Head, thorax, and abdomen black; tegulæ yellow; antennæ black; legs brownish black.

Expanse $1\frac{1}{4}$ inch.

Hab. East Peru (*Whitely*).

A pretty little species allied to *J. auriflua*, from which it is readily distinguished by the great difference in the secondaries.

JOSIOMORPHA, Felder.

JOSIOMORPHA STRIATA, sp. n.

Primaries deep black, with a central narrow band of buff-yellow extending from the base to near the outer margin, where it is reduced to a point; secondaries pale buff-yellow, with the costal, apex, and hind margins narrowly bordered with black. ad, antennæ, thorax, abdomen, and legs all black.

Expanse $1\frac{1}{2}$ inch.

Hab. Ecuador, Sarayacu (*Buckley*).

This species is quite distinct from any with which I am acquainted.

FORMIANA, gen. nov.

Primaries long and broad, with the costal margin much arched near the apex, forming a wide hook, giving the appearance of a piece being cut out of the outer margin between the apex and the anal angle, discoidal cell rather long and broad; secondaries broad and elongated, much rounded-off at the apex. Abdomen extending about one third of its length beyond the wings; anus tufted with short greyish hairs. Thorax broad, clothed with short black hairs. Head small; palpi very small, not clothed with hairs. Antennæ rather long and deeply pectinated; legs slender and rather long.

FORMIANA MÆNADES, sp. n. (Plate XXXII. fig. 18.)

Primaries deep black, with a large, almost triangular, spot beyond the middle, dentated on the outer margin, and a long streak on the inner margin close to the base, citron-yellow: secondaries bright citron-yellow, with the margins narrowly bordered with black. The underside the same as above. The head, thorax, and upper side of the abdomen black; the sides yellow, with a narrow black band, on the underside white; a small yellow spot on each side of the thorax, close to the base of the wings; tegulæ black; antennæ black; legs brownish black.

Expanse $1\frac{3}{4}$ inch.

Hab. Bolivia (*Buckley*).

This very fine insect is quite unlike any known to me; it is perhaps best placed before the genus *Flavinia*, which in some respects it resembles.

Flavinia, Walker.

Flavinia cyrene, sp. n.

Form of *F. postica.* Primaries longer and slightly narrower, the citron-yellow band formed into a large round spot near the apex: secondaries citron-yellow, with the outer margins bordered with black from the apex to anal angle round to the base, thus differing from *F. postica.* Head, thorax, and upper side of abdomen black; sides and underside pale yellow; collar bright yellow; antennæ and legs black.

Expanse $1\frac{1}{2}$ inch.

Hab. Bolivia (*Buckley*).

Flavinia roxana, sp. n. (Plate XXXII. fig. 19.)

Form of *F. læta,* from which it differs in being bright red instead of yellow; the black band crossing the primaries is narrower and more oblique; the large spot near the apex is rounder. The head, thorax, and abdomen are all black, and not striped with yellow as in *F. læta*; antennæ black.

Expanse $1\frac{1}{2}$ inch.

Hab. East Peru, valley of the Cosnipata (*Whitely*).

This species is very distinct from all the others in the genus, being at once distinguished by its bright red colour.

Flavinia ops, sp. n.

Form of *F. læta,* from which it differs in wanting the black band across the primaries; in the specimens before me it is only a black **V**-shaped mark extending from the costal margin across the end of the cell; in this species the black outer borders of the secondaries are only about half the width of those in *F. læta.*

Expanse $1\frac{1}{2}$ inch.

Hab. New Grenada.

Two examples of this species are in the British-Museum collection from the same locality.

Micropus, Hübner.

Micropus elegans, sp. n. (Plate XXXII. fig. 20.)

Primaries bright yellow, with the costal, apex, and outer margins bordered with black, the black border at the apex not being more than half the width it is in *M. longalis*: secondaries bright yellow, with the apex and outer margin narrowly bordered with black. Head, antennæ, and front of thorax black; thorax and abdomen yellow; the anus and two last segments black; the underside of the abdomen dusky white.

Expanse $1\frac{3}{4}$ inch.

Hab. Ecuador, Intaj (*Buckley*).

This species is allied to *M. longalis,* from which it is at once distinguished by its larger size and narrow black borders to the wings.

Mennis, Walker.

Mennis fidentia, sp. n. (Plate XXXIII. fig. 1.)

Primaries brick-red, with the apical third of the wing sooty black: secondaries brick-red, bordered with black from the apex to the anal angle; the underside the same as above. Head, thorax, and abdomen black; antennæ, palpi, and legs brownish black.

Expanse $1\frac{1}{4}$ inch.

Hab. Colombia, Antioquia (*Salmon*).

A well-marked and very distinct little species, not nearly allied to any with which I am acquainted.

Mennis herona, sp. n. (Plate XXXIII. fig. 2.)

Primaries from the base to the middle dull red, from the middle to the outer margin semihyaline smoky black: secondaries dull red, broadly banded with black at the apex, the outer and inner margin narrowly streaked with black. Head, thorax, and abdomen brownish black; the antennæ and legs black. The underside the same as above in all respects.

Expanse 1 inch.

Hab. Ecuador, Sarayacu (*Buckley*).

A pretty little insect allied to the preceding species, from which it is at once distinguished by its much more slender form and different position of the red markings.

Mennis ficulnea, sp. n. (Plate XXXIII. fig. 3.)

Primaries semihyaline, clouded with bright red from the base to beyond the middle, the apex and outer margin to the anal angle broadly bordered with semitransparent black; from anal angle along the inner margin to near the base slightly clouded with greyish white: secondaries bright red, somewhat transparent, broadly bordered with black from the apex to the anal angle, where the border becomes quite narrow. Head, thorax, and abdomen greyish black; antennæ black.

Expanse $1\frac{1}{2}$ inch.

Hab. Ecuador, Intaj (*Buckley*).

This species is very distinct, but comes nearest *M. fidentia*.

Mennis hagno, sp. n.

Primaries shape and form of *M. ficulnea*, but smaller and the red colour of a much more orange shade, the outer half of the wings being dove-colour instead of black; the secondaries differ in the same way as the primaries, the dove-coloured borders being wider than in *ficulnea*. Head and thorax black; tegulæ red; abdomen black, banded with dove-colour; antennæ and legs black.

Expanse $1\frac{1}{2}$ inch.

Hab. Ecuador, Intaj (*Buckley*).

This species is easily distinguished from its allies by the dove-coloured margins of the wings.

Mennis halia, sp. n. (Plate XXXIII. fig. 4.)

Primaries dull black, with a narrow streak from the base to the end of the cell, and one from the base along the inner margin to the anal angle, brick-red; a band of four brick-red spots following the outer margin, the two first the largest, the third and fourth quite small: secondaries uniform brick-red, narrowly bordered with black from the apex to the anal angle. Head, thorax, and abdomen black; antennæ and legs black.

Expanse 1 inch.

Hab. Ecuador, Chiguinda (*Buckley*).

A beautiful little species, very distinct from any that I am acquainted with.

Mennis ficaria, sp. n. (Plate XXXIII. fig. 5.)

Primaries black, thickly blotched with blood-red spots; secondaries blood-red, narrowly bordered with black; underside the same as above. Head, thorax, and abdomen black; tegulæ red; antennæ and legs black.

Expanse $\frac{3}{4}$ inch.

Hab. Ecuador, Chiguinda (*Buckley*).

This beautiful little species varies very much; some of the specimens have the primaries quite black, but the series before me shows almost every intermediate between the specimens with the spotted primaries and those with black primaries. Taken separately I have little doubt that many entomologists would consider them as distinct species; but with the series in my collection I have not the slightest doubt that they all belong to one very variable insect.

Devara, Walker.

Devara bubona, sp. n. (Plate XXXIII. fig. 6.)

Primaries dull black, with a large white patch extending from the base to about the middle, rounded on the outer edge: secondaries uniform dull black. Underside of primaries black, with the basal half white, the costal margin and apex shaded with greyish brown; secondaries silver-grey clouded with brown, the nerves all black. Head, antennæ, thorax, and abdomen black.

Expanse, ♂ $1\frac{1}{4}$ inch, ♀ $1\frac{1}{2}$ inch.

Hab. Ecuador, Sarayacu (*Buckley*).

Devara phyleis, sp. n.

Primaries black, with a large central round white spot slightly nearest the inner margin; secondaries brownish black. Head, antennæ, and thorax black; abdomen brownish black above, on the underside dusky white. Underside of the wings dusky white, with the outer margins broadly bordered with greyish brown.

Expanse $1\frac{1}{4}$ inch.

Hab. Ecuador, Intaj (*Buckley*).

This species is allied to *D. bubona,* from which it is at once distinguished by the different position of the white patch on the primaries.

Nelo, Walker.

Nelo uxisama, sp. n. (Plate XXXIII. fig. 7.)

Primaries black, glossed with dark blue from the base to beyond the middle; a large spot beyond the end of the cell bright red glossed with a blue shade: secondaries deep black. Underside of primaries pale brown, with the red spot as above; secondaries pale brown, with the nerves dark brown and a small red dot at the base. Head, antennæ, thorax, and abdomen brownish black; tegulæ black, red at the base; legs black.

Expanse $1\frac{1}{2}$ inch.

Hab. Ecuador, Intaj (*Buckley*).

This beautiful species is allied to *N. discalis*, Walk., from Bolivia.

Nelo xenopithia, sp. n.

Primaries dark brown, with an elongated oval spot at the end of the cell, bright red, glossed on the inner edge with dark blue: secondaries uniform dark brown. Underside uniform dark reddish brown, with the nerves all black, the red spot on the primaries larger and brighter in colour than on the upper side. Head, antennæ, and thorax brownish black; abdomen brown; tegulæ red at the base; legs dark brown.

Expanse $1\frac{1}{2}$ inch.

Hab. Ecuador, Sarayacu (*Buckley*).

This species is quite distinct from any other known to me.

Nelo tolosa, sp. n.

Primaries dull black, with a brilliant blue round patch beyond the cell, in the centre of which is a small orange-yellow dot; secondaries very dark brown. Underside of both wings uniform glossy brown, with the nerves black. Head, thorax, abdomen, and legs black; antennæ and palpi black.

Expanse $1\frac{1}{4}$ inch.

Hab. Ecuador, Sarayacu (*Buckley*).

This species is allied to *N. xenopithia*, from which it is at once distinguished by the spot of the primaries being bright blue instead of red.

Nelo tomisa, sp. n. (Plate XXXIII. fig. 8.)

Primaries brilliant dark blue, with the costal and outer margins bordered with deep black, a very minute red spot at the end of the cell: secondaries uniform deep black. Underside of both wings silky brown, with a small red band beyond the cell on the primaries, and a minute red dot at the base of the secondaries. Head, antennæ, thorax, abdomen, and legs brownish black; tegulæ black, with the base red.

Expanse $1\frac{1}{4}$ inch.

Hab. Ecuador, Sarayacu (*Buckley*).

This beautiful little species is quite distinct from any with which I am acquainted.

Nelo veliterna, sp. n. (Plate XXXIII. fig. 9.)

Size and form of *N. chrysomela*. Primaries brownish black with a central orange-red patch, almost the same as in *N. chrysomela*; secondaries uniform dark brown. Underside of primaries the same as above, but the red colour of the patch not quite so bright; secondaries uniform glossy brown, with the nerves all black. Head, antennæ, thorax, and abdomen black; tegulæ reddish.

Expanse 1 inch.

Hab. Ecuador: Chiguinda, Intaj, Sarayacu (*Buckley*); Colombia: Fusagusuga, Pacho, Tolima (*Chapman*).

This pretty little species is allied to *N. chrysomela*, but can at once be distinguished from that insect by its dark-brown secondaries, instead of bright orange as in that species.

Nelo splendens, sp. n. (Plate XXXIII. fig. 11.)

Primaries dark brown, with a large round patch of orange-red in the middle, also the base and half the costal margin narrowly streaked with red; on the underside bright orange-red, with the apex, outer and inner margins bordered with golden brown: secondaries uniform dark brown; on the underside golden brown, with the nerves black. Head, antennæ, and thorax black; abdomen black above, but lighter on the underside; legs black.

Expanse $1\frac{3}{4}$ inch.

Hab. Ecuador (*Buckley*).

This fine species is most nearly allied to *N. fustina*, but very distinct.

Nelo fustina, sp. n. (Plate XXXIII. fig. 10.)

Primaries dark brown, with a very narrow streak from the base halfway along the costal margin brick-red; a narrow band near the apex, much rounded on the outer edge, dull brick-red; secondaries uniform dark brown: underside the same as above, but lighter in colour, and all the nerves black. Head, antennæ, thorax, and abdomen dark brown; legs black.

Expanse $1\frac{1}{2}$ inch.

Hab. Ecuador, Sarayacu (*Buckley*).

This species can easily be distinguished from all its allies by its very dull colouring, and by the very different position of the red markings on the primaries.

Nelo paterna, sp. n. (Plate XXXIII. fig. 12.)

Primaries dark blue-black, with a short orange-coloured band at the end of the cell, not reaching the costal or inner margin; in some lights the orange-coloured band is glossed with pinkish blue. Underside sooty black, with the band longer and broader; secondaries uniform dark blue-black; on the underside brownish black, with all the nerves black. Head, thorax, abdomen, antennæ, and legs dull black.

Expanse $1\frac{3}{4}$ inch.

Hab. Ecuador, Sarayacu (*Buckley*).

This species comes nearest *N. fustina*, but it is black instead of brown.

NELO PHILODAMEA, sp. n. (Plate XXXIII. fig. 13.)

Primaries deep blue-black, with a brilliant dark-blue patch beyond the middle; secondaries uniform deep black; the underside sooty black, with all the nerves deep black. Head, antennæ, thorax, and abdomen dull black.

Expanse $1\frac{3}{4}$ inch.

Hab. Ecuador, Sarayacu (*Buckley*).

This very fine insect is allied to *N. refulgens*, Felder, from which it is at once distinguished by its greater size, and the entire absence of the white band across the primaries; the white band is replaced by a most brilliant blue patch.

SANGALA, Walker.

SANGALA ANTIPHATES, sp. n. (Plate XXXIII. figs. 14, 15.)

Primaries and secondaries brilliant dark blue, with the costal and outer margins narrowly bordered with black. Underside of primaries uniform silky dove-colour. Secondaries dove-colour, with the nerves black; a band of four elongated white spots placed between the nerves, the first spot on the costal margin close to the anal angle. Head, antennæ, thorax, and abdomen deep black; the sides of the abdomen with narrow red lines.

Expanse $1\frac{3}{4}$ inch.

Hab. Ecuador, Sarayacu (*Buckley*).

This fine species is allied to *S. beata*, Walker, but on the underside it is very distinct.

ERBESSA, Walker.

ERBESSA CALYDON, sp. n.

Primaries brownish black, with a central longitudinal streak from the base to about the middle, bluish hyaline, beyond which an oblique white hyaline band, not extending to the costal margin: secondaries whitish hyaline, broadly bordered with black from the apex to the anal angle; the nerves black. Head, thorax, and abdomen black; antennæ and legs brownish black.

Expanse $1\frac{1}{2}$ inch.

Hab. Ecuador, Sarayacu (*Buckley*).

This beautiful little species is quite distinct.

ERBESSA CAPENA, sp. n.

Primaries bluish black; the nerves bluish white from the base to about the middle; a transverse hyaline band across the middle of the cell extending to the anal angle, beyond and nearer the apex; an elongated white spot followed by two smaller spots close to the outer margin. Secondaries whitish hyaline shot with blue; the costal margin, apex, and outer margin broadly banded with bluish black, a small white hyaline spot close to the apex. Head, thorax, and antennæ black; abdomen brownish black shot with blue, with a narrow white line on either side; the underside white; legs dusky white.

Expanse $1\frac{3}{4}$ inch.

Hab. Ecuador, Sarayacu (*Buckley*).

Pseudebessa.

Pseudebessa cassandra, sp. n.

Primaries black, with the base shot with bright blue; from the base to beyond the middle, at the end of the cell and reaching almost to the anal angle, a large elongated whitish hyaline spot; the apex narrowly bordered with white: secondaries whitish hyaline, broadly margined with black, shot with brilliant blue. Head, antennæ, and legs black; thorax and abdomen black, glossed with bright blue.

Expanse $1\frac{1}{2}$ inch.

Hab. Ecuador, Sarayacu (*Buckley*).

This beautiful little species is very distinct from all others with which I am acquainted.

Pseudebessa caresa, sp. n.

Primaries dull black, with a central round white spot, and a white streak near the base on the inner margin: secondaries whitish hyaline, broadly bordered with black. Head and palpi bright orange-yellow; thorax black; abdomen and legs brownish black; antennæ black.

Expanse $1\frac{1}{4}$ inch.

Hab. East Peru (*Whitely*).

A dull-coloured little species, but very distinct.

Family Euschemidæ.

Phæochlæna, Hübn.

Phæochlæna inaria, sp. n. (Plate XXXIII. fig. 16.)

Primaries deep black, with an elongated streak from the base near the inner margin to about the middle, and a small oval spot near the apex creamy white: secondaries creamy white, broadly bordered with black; the underside the same as above. Head black, with the front and sides yellowish white; thorax black, with a central yellow line; tegulæ white. Abdomen black above, with a central white line from the base almost reaching the anus, and a narrow deep yellow line on either side; on the underside creamy white. Antennæ and legs black.

Expanse 1 inch.

Hab. Ecuador: Intaj, Sarayacu (*Buckley*).

In form this species resembles *P. solitucis*, Butler.

PHÆOCHLÆNA CINGULINA, sp. n.

Primaries deep black, with all the nerves light ochraceous brown; an oval spot at the end of the cell, and a triangular one between the median nerve and the inner margin, slightly nearer the base than the apex, creamy white: secondaries creamy white, with the margins broadly banded with black. Head, thorax, and abdomen black; tegulæ and sides of head bright orange; a central streak, and the underside of the abdomen white; antennæ and legs black.

Expanse $1\frac{1}{8}$ inch.

Hab. East Peru (*Whitely*).

PHÆOCHLÆNA AURANTICA, sp. n. (Plate XXXIII. fig. 17.)

Primaries deep black, with all the nerves bright orange-yellow: secondaries creamy white, with the margins broadly banded with black. Head, thorax, and abdomen black; the abdomen with a central streak, and one on each side bright yellow; antennæ and legs black.

Expanse $1\frac{1}{4}$ inch.

Hab. Bolivia (*Buckley*).

This species is allied to the preceding, from which it is at once distinguished by the entire absence of the white spots on the primaries.

EXPLANATION OF THE PLATES.

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PLATE XXXIII.

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5. A List of the Lepidoptera collected by Mr. H. H. Johnston during his recent expedition to Kilima-njaro. By F. D. Godman, F.R.S., &c.

[Received May 14, 1885.]

Mr. Johnston's collection of Lepidoptera contains 61 specimens, including examples of 27 species; of the latter there are 21 species of Rhopalocera and 6 of Heterocera. Of the Rhopalocera I have described three species as new, and a fourth, a *Chrysophanus*, of which only one specimen of a female is in the collection, remains unnamed, though it too is probably new. This small collection therefore contains nearly twenty per cent. of novelties, which must be considered a high proportion.

But so small is the series that I do not think any comparison of the Lepidopterous fauna of this region with that of the rest of Africa can be entered upon with advantage. Suffice it to say that by far the majority of the species are widely distributed African ones; that there is a northern element, as shown in *Colias edusa*, and perhaps the *Chrysophanus*; and that there is barely a trace of the Abyssinian fauna in the materials before me. But these suggestions may all be set aside whenever a really representative collection is made. Of the 27 species no less than 19 are represented by single specimens.

Rhopalocera.

1. Danais dorippus.

Euplœa dorippus, Klug, Symb. Phys., Insecta, t. 48. f. 1–5.

Kilima-njaro, rocky, wooded, and cultivated country and grassy downs, at 4000–5000 feet, July.

Four examples (2 ♂, 2 ♀).

None of these specimens have any white on the secondaries, and agree best with fig. 5 of Klug's plate. *D. dorippus* is a common East-African species.

2. Acræa johnstoni, sp. nov.

Alis anticis rufis, apicibus et marginibus externis (introrsum valde sinuatis) nigro-fuscis; posticis ad basin et marginibus externis late nigrescentibus, area discali albida venis fuscis divisa; subtus anticis fere omnino rufis ad marginem externum canescentibus, venis nigris et inter eas striolis fuscescentibus; posticis ut supra, limbo externo canescente, venis et striolis inter eas diviso; maculis quibusdam ad basin nigris; palpis, femoribus interne, abdomine infra, et maculis costalibus, rufis; capite et thorace maculis albis notatis.

Kilima-njaro, clearing in forest at 5500 feet, September.

A single male specimen of this apparently very distinct species.

3. Acræa insignis.

Acræa insignis, Distant, P. Z. S. 1880, p. 184, t. xix. f. 6.
Acræa buxtoni, Hew. Ent. Month. Mag. xiv. p. 154.

Kilima-njaro, wooded hills at 5000 feet, August.

This insect was first described by Hewitson from examples procured by Buxton in the neighbourhood of Zanzibar, and was named by him after its discoverer. Mr. Distant pointed out that the name *A. buxtoni* had been already applied to another species by Mr. Butler, and hence renamed it as above. Our collection contains a good series of this insect, chiefly taken by Mr. Last at Manboia in Eastern Central Africa. These exhibit considerable variation in the amount of black at the base of the secondaries, for while some specimens have only four or five isolated spots, others have a large confluent patch occupying the basal third of these wings, and between these two extremes we have every intermediate form, all captured in the same locality and at the same time.

Mr. Johnston procured but a single example, which has the confluent black patch and agrees in this respect with some of our own specimens from Manboia.

4. Acræa bræsia, sp. nov.

Alis anticis semihyalinis ad basin rosaceo suffusis; macula in cellula, altera ad finem ejus, quinque in serie fere recta ultra eam, una inter ramos medianos, duabus inter ramum medianum primum et venam submedianam nigris, margine externo fusco-nigro maculis lunulatis submarginalibus rufis; posticis rosaceis ad basin obscurioribus, margine externo nigro, area discali plus minusve maculata; subtus anticis fere ut supra; posticis flavidis nigro distincte maculatis, ad basin et marginem internum rosaceo notatis; margine externo nigro lunulas septem flavidas includente; fronte, palpis et pedibus fulvis; abdomine subtus flavido, lateribus albo maculatis; capite, prothorace et thorace albido distincte maculatis.

Kilima-njaro, in wooded country at 5000 feet, August.

A single male specimen allied to *A. oncæa*, differing in its diaphanous primaries and its more rosy secondaries.

5. Acræa natalica.

Acræa natalica, Boisd. Voy. Deleg. ii. p. 590; Hopff. in Pet. Reise, Zool. v. p. 371, t. 23. f. 12, 13.

Kilima-njaro, grassy downs at 6000 feet, June.

One example (♀).

Agrees best with specimens of this species, but the disk of the secondaries is whiter and the spots in general are larger.

6. Pyrameis cardui.

Papilio cardui, Linn. Syst. Nat. i. p. 276.

Kilima-njaro, in thin forest country at 7000 feet, July.

One much worn male.

7. Junonia clelia.

Papilio clelia, Cram. Pap. Exot. t. 21. f. E, F.

Kilima-njaro, rocky country at 4000 and 5000 feet, wooded country and grassy downs at 5000 feet, June to July.

8. Junonia œnone.

Papilio œnone, Linn. Mus. Ulr. pp. 274, 275.

Kilima-njaro, in rocky, grassy, and wooded country, at 5000 feet, wooded country at 6000 feet, June and July.

Six specimens, all males, of this widely ranging species.

9. Precis sesamus.

Precis sesamus, Trimen, Trans. Ent. Soc. 1883, p. 347.

Kilima-njaro, forest country at 7000 feet, July.

One example (♂).

10. Lycæna gaika.

Lycæna gaika, Trimen, Trans. Ent. Soc. 3rd ser. i. p. 403.

Kilima-njaro, grassy downs at 5000 feet, June.

One male.

The single specimen agrees with Trimen's description and with our series of this species. It appears to us to be distinct from *L. lysamon*, with which Mr. Trimen united his *L. gaika* in the 'Rhopalocera Africæ Australis.' Both species occur in South Africa; but *L. lysamon* may always be distinguished by the presence of a black spot within the cell of the primaries.

11. Chrysophanus, sp.?

Kilima-njaro, grassy downs at 5000 feet, June.

A single female example of a true *Chrysophanus*, which we are unable to recognize and which we hesitate to describe without specimens of the other sex.

12. Terias rahel?

Papilio rahel, Fabr. Ent. Syst. iii. p. 204 (apud Trimen).

Kilima-njaro, wooded country at 5000 feet, August.

A single female specimen, which we cannot undertake to determine with certainty without examples of the other sex. It may possibly be the female of *T. candace*, Feld., from Abyssinia.

13. Pieris severina.

Papilio severina, Cram. Pap. Exot. t. 338. f. G, H.

Kilima-njaro, wooded country at 5000 to 6000 feet, July and August. Tavieta, dense forest at 2300 feet, September.

One male and three females.

14. Pieris hellica.

Papilio hellica, Linn. Syst. Nat. i. p. 760.

Kilima-njaro, wooded, rocky, and cultivated ground, grassy downs, at 4000 to 5500 feet, July and August.

Thirteen males and one female.

All the specimens have the primaries rather more pointed, with a slightly blacker apex, and the colouring of the underside is brighter than in the examples in our own collection.

15. Eronia cleodora.

Eronia cleodora, Hübn. Samml. exot. Schmett. ii. t. 130.

Tavieta, in dense forest at 2300 feet.

16. Callidryas pyrene.

Colias pyrene, Swains. Zool. Ill. i. t. 51.

Kilima-njaro, in wooded country at 5000 feet.

Two females only.

17. Callidryas florella.

Papilio florella, Fabr. Syst. Ent. p. 479.

Kilima-njaro, in wooded country, at 6000 feet.

A single female specimen.

18. Colias edusa.

Papilio edusa, Fabr. Mant. Ins. ii. p. 23.

Kilima-njaro, wooded and grassy country at 4000 and 5000 feet, July.

Four males and one female.

19. Teracolus auriginius.

Teracolus auriginius, Butl. Ann. Mag. Nat. Hist. ser. 5, vol. xii. p. 103.

Kilima-njaro, in wooded and grassy country, 5000 and 6000 feet.

Two examples agreeing with specimens in the British Museum thus named by Mr. Butler.

20. Papilio demoleus.

Papilio demoleus, Linn. Syst. Nat. i. p. 753.

Kilima-njaro, in wooded country at 5000 feet, August.

A single specimen of this common African species.

21. Papilio brontes, sp. nov.

Alis nigris, fascia lata communi, ad costam anticarum disjuncta, metallico-cærulea, macula parva ad anticarum apicem et posticis serie submarginali ejusdem coloris; subtus fusco-nigris, anticis ad apicem et posticis omnino, brunnescentioribus, his venis et striis tribus in cellula longitudinalibus nigris, fascia communi submarginali a vena mediana anticarum ad angulum posticarum analem transeunte, venis nigris divisa, in anticis quoque inter venas bisecta lactescente-alba, margine posticarum interno maculis parvis duabus ejusdem coloris, posticis subcaudatis, vena mediana producta.

Kilima-njaro, in forest country at 5000 feet, August.

Allied to *Papilio bromius*, but the transverse band is of a deeper blue, both wings are less elongated, the secondaries are more acutely produced at the anal angle. Beneath, the light-coloured submarginal band is straighter on the secondaries and less broken up, moreover it is extended on the primaries as far as the median nervure beyond the cell; the apex of primaries and the secondaries are browner, and though the latter have three radiating streaks in the cell as in *P. bromius*, there are no intervenal streaks beyond it.

A single male specimen is the only one Mr. Johnston obtained.

Heterocera.

Mr. Johnston's collection contains six specimens of as many species of Heterocera, and for these Mr. Butler has kindly given us the following names.

22. Acherontia atropos.

Kilima-njaro, forest at 3000 feet, September.

23. Mecyna polygonalis.

Kilima-njaro, wooded country at 5000 feet, August.

24. Hypina, sp.?

Kilima-njaro, wooded country at 5000 feet, July.

25. Sterrha oacraria.

Kilima-njaro, scrubby heath at 8000 feet, July.

26. Prodenia?

Kilima-njaro, wooded country at 5000 feet, September.

27. Amyna, sp.?

Kilima-njaro, wooded country at 5500 feet, August.

June 2, 1885.

Prof. W. H. Flower, LL.D., F.R.S., President, in the Chair.

Mr. F. E. Beddard read an account of the anatomy of the Sondaic Rhinoceros (*Rhinoceros sondaicus*), drawn up by Mr. F. Treves, F.R.C.S., F.Z.S., and himself from the specimen of that Rhinoceros lately living in the Society's Menagerie.

This paper will be published entire in the Society's 'Transactions.'

A communication was read from Dr. Julius von Haast, F.R.S., C.M.Z.S., containing an account of the remains of a gigantic extinct bird allied to *Apteryx* recently discovered in New Zealand, on which it was proposed to found a new genus and species, to be called *Megalapteryx hectori*.

This memoir will be printed entire in the Society's 'Transactions.'

Mr. Sclater remarked that the two Colies purchased on the 20th March last, and specially mentioned in his report for the month of March (see P. Z. S. 1885, p. 322) as *Colius striatus*, were, as he was assured by Capt. Shelley, who had lately been engaged on a study of this group, the Cape Coly (*Colius capensis*).

The four species of this singular group of which the Society had living specimens were therefore :—

1. *Colius castanonotus*, Verr. Chestnut-backed Coly. Angola. (See P. Z. S. 1876, p. 413, plate xxxv.)
2. *Colius erythromelon.* Red-cheeked Coly. South Africa. (See P. Z. S. 1884, p. 475, plate xlv.)
3. *Colius nigricollis.* Black-necked Coly. West Africa. (See P. Z. S. 1884, p. 530, plate xlv. fig. 1.)
4. *Colius capensis.* Cape Coly. South Africa. (Two, purchased 20 March, 1885.)

Of these the two Cape Colies, together with one Red-cheeked Coly and one Black-necked Coly, were still alive in one large cage in the Parrot-house.

The following papers were read :—

1. Report on the Collection of Birds obtained during the Voyage of the Yacht 'Marchesa.'—Part IV. Celebes. By F. H. H. Guillemard, M.A., M.D., F.L.S., &c.

[Received May 20, 1885.]

The cruise of the 'Marchesa' having been for the most part confined to northern Celebean waters, no great novelties could be looked for among the 112 species collected there. The researches of Wallace, Meyer, Von Rosenberg, and others have made us thoroughly acquainted with the avifauna of this portion of the island, but the south-eastern peninsula as yet remains almost unknown; and, when we bear in mind the differences of distribution which occur between the Macassar and Menado districts, it seems not improbable that a visit to that part and its neighbouring islands would be amply repaid.

The 'Marchesa,' after a short stay in Macassar, from which port a visit was made to the Maros district, sailed for Menado in North Celebes, and remained on this coast and in the Gorontalo Gulf for several weeks. No new species were obtained, but three—*Astur trivirgatus*, *Alcedo bengalensis*, and *Halcyon pileata*—have not hitherto been recorded from Celebes. The following is a list of the birds collected, together with such short notes as have been deemed necessary.

1. Tanygnathus muelleri (S. Müller and Schlegel).

Tanygnathus mülleri, Wald. Tr. Z. S. vol. viii. pt. 2, p. 31.

a. ♂. Talisse Island, N. Celebes.

b. ♂. Menado.
c. ♀. Menado.

Bill scarlet; tarsus olive-green. Length of wing 21·5 centims.

I did not observe very many either of this or the following species in N. Celebes; but I was led to the conclusion that they were distinct from the larger size of the present species in the flesh. In *b* the nterscapulars are lightly tipped with blue.

2. Tanygnathus albirostris, Wallace.

Tanygnathus albirostris, Wall. P. Z. S. 1862, p. 336.

a. ♂. Menado.
b. ♀. Menado.

Bill creamy white; feet brownish olive. Wing 20·3–20·7 centims. Head markedly green in both, with no golden shade. General surface characterized in like manner by absence of the yellow shade. Blue on the wing-coverts almost non-existent.

3. Prioniturus platurus (Kuhl).

Prioniturus platurus, Wald. *op. cit.* p. 32.

a. ♂. Menado.
b–e. ♀. Kema.
f. ♂. Wallace Bay, N. Celebes.

Native name *Kakatua birotti.*

In one female the wing-coverts are as in the adult male; in two others they are becoming grey, while in the fourth, although the tail is provided with a racket, the wing-coverts are of a uniform green. In one of the examples in which the wing-coverts are already changing there is no sign of a racket. Iris brown; bill lead-coloured; feet greyish. Wing about 18·0 centims., length 32·8.

4. Prioniturus flavicans, Cassin.

Prioniturus flavicans, Wald. *op. cit.* p. 32.

a. ♂. Wallace Bay, N. Celebes.
b. ♀. Likoupang.

Bill whitish slate; tarsus slate. In *a* the median pair of rectrices are prolonged about half an inch beyond the rest, and the racket is being formed apparently by the gradual erosion of the webs along the shaft of the feather.

5. Loriculus stigmatus (Müller & Schl.).

Loriculus stigmatus, Wald. *op. cit.* p. 32.

a, b. ♂. Menado.
c. ♀. Menado.
d, e. ♀. Kema.

Native name *Tientis.*

Iris brown; bill black; legs pinkish. Length about 15·5 centims., wing length 9·4–9·7. Met with also near Tondano.

6. Loriculus exilis, Schlegel.

Loriculus exilis, Wald. *op. cit.* p. 32.

a. ♂. Menado.
b–d. ♀. Menado.

Iris brown; bill dull red; tarsus yellow. Length 10·2 centims., wing 6·8. The female is without the red throat.

7. Trichoglossus ornatus (Linnæus).

Trichoglossus ornatus, Wald. *op. cit.* p. 32.

a–c. ♂. Menado.
d, e. ♀. Menado.
f. Menado.
g. ♂. Gorontalo.
h, i. Kema.

Iris reddish yellow; bill scarlet; feet bluish green. Length 23 centims., wing 12·3–12·8. Native name *Pakiji.* The example *g* is remarkable for having the wing and tail pale yellow, spotted and washed with green. It had been in captivity. In two others the interscapulars have a broad subterminal bar of yellow. This species is one of the commonest birds of the north of Celebes.

8. Trichoglossus meyeri, Walden.

Trichoglossus meyeri, Wald. *op. cit.* p. 32.

a. ♀. Menado.

Native name *Pakiji lelaro.*

9. Spilornis rufipectus, Gould.

Spilornis rufipectus, Wald. *op. cit.* p. 35.

a. ♂. Maros River, S. Celebes.
b. Kema.

Iris brilliant yellow; bill black; tarsus yellow.

10. Astur griseiceps, Schlegel.

Lophospiza griseiceps, Wald. *op. cit.* p. 33.

a. ♂. Kema.
b. Kema.

I am without notes on the greater number of the Raptorial birds, the majority of the specimens having been shot by two of our native hunters during our absence.

11. Astur trinotatus, Bp.

Erythrospiza trinotata, Wald. *op. cit.* p. 33.

a, b. Kema.
c. ♂. Menado.
d. ♀. Menado.
e. Juv. Menado.

Native name *Sikap abuabu.*

12. Astur soloensis (Horsf.).

Tachyspiza soloensis, Wald. *op. cit.* p. 34.

a. Kema.

13. Astur trivirgatus, Temminck.

a. Juv. Likoupang, N. Celebes.

Iris light brown; bill black; tarsus yellow. This species has not before been recorded from Celebes.

14. Accipiter rhodogaster (Schlegel).

Teraspiza rhodogaster, Wald. *op. cit.* p. 33.

a. Juv. Menado.

b. Kema.

15. Limnaetus lanceolatus, Bp.

Limnaetus lanceolatus, Wald. *op. cit.* p. 34.

a. Kema.

16. Haliætus leucogaster (Gm.).

Cuncuma leucogaster, Wald. *op. cit.* p. 35.

a. ♂. Limbe Island, N. Celebes.

17. Butastur indicus (Gm.).

Poliornis indicus, Wald. *op. cit.* p. 37.

a, b. ♂ *juv.* Menado.

c. ♀ *juv.* Menado.

Native name *Tegit.*

18. Pernis celebensis, Walden.

Pernis ptilorhyncha, Wald. *op. cit.* pp. 36, 111.

a. ♂ *juv.* Menado.

Native name *Kohéba.*

Mr. Gurney, to whom, for his kind help in the identification of many of the Raptorial birds, I am greatly indebted, says:—"This specimen shows considerable remains of immature plumage, in which stage this species has not, so far as I know, been yet described. The present example differs from the adult bird in the following particulars: the cheeks are dark chocolate-brown instead of bluish grey; there is much white about the jugulars and breast, probably indicating that in the nestling plumage these parts are entirely white; the white interspaces between the dark bars on the abdomen and under tail-coverts are larger, and the dark bars smaller, than in the adult; the under wing-coverts instead of being transversely barred with white and dark brown alternately, are all white, with the exception of slight and imperfect brown barring on the lowest row of feathers, and dark shaft-marks on these and on the feathers next the edge of the wing."

19. Scops menadensis, Q. et G.

Ephialtes menadensis, Wald. *op. cit.* p. 40.

a. ♂. Menado.

b, c. ♀. Menado.

d-f. Kema.

None of the examples exhibit any distinct rufous colouring.

20. NINOX PUNCTULATA.

Ninox japonicus, Wald. *op. cit.* p. 40.

a. N. Celebes.
Iris brown.

21. STRIX ROSENBERGI, Schlegel.

Strix rosenbergi, Wald. *op. cit.* p. 41.

a. Kema.

22. MULLERIPICUS FULVUS (Q. et G.).

Mulleripicus fulvus, Wald. *op. cit.* p. 41.

a, b. ♂. Menado.
c. ♂. Likoupang.
d. ♂. Kema.
e, f. ♀. Kema.
g. ♀. Menado.
h. ♀. Likoupang.
Native name *Burong tukan.* Iris light yellow; bill black; feet greenish grey. Length about 38·7 centims., wing 17·2–18·4. Common in North Celebes.

23. IYNGIPICUS TEMMINCKII (Malherbe).

Yungipicus temminckii, Wald. *op. cit.* p. 41.

a, b. ♂. Kema.
c. ♀. Tondano.
Iris brown; bill greyish brown; tarsus dull olive. The female specimen exhibits a marked ruddy tinge on the interscapulars, edges of the primaries, and upper surface of the tail.

24. MEROPS ORNATUS, Latham.

Merops ornatus, Wald. *op. cit.* p. 42.

a. ♂. Menado.
b. ♀. Menado.
Iris dull red; bill black; feet greyish black. Length 25·0 centims., wing 11·2–11·6.

25. CORACIAS TEMMINCKI (Vieillot).

Coracias temminckii, Wald. *op. cit.* p. 43.

a–d. ♂. Menado.
e. ♂. Kema.
f. Kema.
Iris brown; bill black; tarsus dirty brownish black. Length about 35·0 centims., wing 19·2–19·5. Native name *Tonkaka.*

26. EURYSTOMUS ORIENTALIS (Linnæus).

Eurystomus orientalis, Wald. *op. cit.* p. 43.

a. ♂. Limbe Island, N. Celebes.
b, c. Kema.

27. ALCEDO BENGALENSIS, Gmelin.

a. ♀. N. Celebes.
b. ♀. Kema.

Bill as in *A. moluccensis*, with the basal part of lower mandible orange in the female. Length 16·5 centims., wing 7, bill 4·4–4·9. This is, I believe, the first instance of this species being recorded from Celebes.

28. ALCEDO MOLUCCENSIS, Blyth.

Alcedo moluccensis, Wald. *op. cit.* p. 45.

a. ♂. Kema.
b, c. ♀. Kema.

Iris brown; tarsus bright red; bill black in the male; the females have the base of the lower mandible orange. Length of female 17·7 centims., wing 7·4, bill 4·7–4·9.

29. PELARGOPSIS MELANORHYNCHA (Temminck).

Pelargopsis melanorhyncha, Wald. *op. cit.* p. 45.

a–c. Kema.
d, e. ♀. Limbe Island.
f. ♀. Pogoyama, Gulf of Gorontalo.

Iris brown; bill black, red inside; feet reddish black, coral beneath. Length 37 centims., wing 15·2, bill from gape 9–9·4. In the not quite adult birds the delicate cream-coloured feathers of the upper part of the breast are tipped with brown. The head appears to get paler with age.

30. MONACHALCYON MONACHUS (Temminck).

Monachalcyon princeps, Wald. *op. cit.* p. 43.

a, b. ♂. Kema.
c. Menado.
d, e. ♂. Menado.
f. ♀. Menado.
g. Juv. ♀. Menado.

The hitherto presumed young bird has, I believe, been separated as a different species. Example ♀ is certainly remarkably small, but those that I have seen all bear evidences of undoubted immaturity. The native name is *Rajah uvang*.

31. SAUROPATIS CHLORIS (Bodd.).

Sauropatis chloris, Wald. *op. cit.* p. 44.

a. ♂. Gorontalo.
b. Juv. Tomohon, N. Celebes.
c–e. ♀. Menado.

Iris brown; bill black; basal half of lower mandible white; tarsus dirty greenish brown.

32. SAUROPATIS SANCTUS (Vig. et Horsf.).

Sauropatis sancta, Wald. *op. cit.* p. 44.

a. ♀. Menado.

Iris brown; tarsus dull green; bill as in *S. chloris*. The chin, throat, and centre of abdomen are pure white. Length 21·1 centims.

33. HALCYON COROMANDA (Latham).

Callialcyon rufa, Wald. *op. cit.* p. 44.

a. Kema.

34. HALCYON PILEATA, Bodd.

a–c. Kema.

The authenticity of the occurrence of this species in N. Celebes rests entirely with a native hunter whom we left in that district to collect. I have, however, no reason to doubt it, although personally I did not meet with the bird. Two of the specimens are not quite adult, the feathers on the upper part of the breast being edged with brownish black, giving a *maillée* appearance. In Mr. Sharpe's monograph no mention is made of the small patch of white feathers on the lower eyelid.

35. CITTURA CYANOTIS (Temminck).

Cittura cyanotis, Wald. *op. cit.* p. 44.

a. ♂. Maim Bay, near Likoupang, N. Celebes.

b, c. ♀. Menado.

d–f. Kema.

Iris brown; bill coral; tarsus dark red; feet bright red beneath. Native name *Bulu bebek*.

The female birds have the white eyebrow, and appear to be *C. sanguirensis* of Mr. Sharpe. They are further characterized by having the stripe through the eye black washed with blue, not blue. The wing-coverts also are marked with buff, not being dark indigo as in the male.

36. CEYCOPSIS FALLAX (Schlegel).

Ceycopsis fallax, Wald. *op. cit.* p. 45.

a. *Sex incert.* Wallace Bay, N. Celebes.

b. Kema.

Iris brown; bill in *a* slate, lower mandible red; in *b* brilliant coral; feet bright coral-red. Length 12·2 centims.

The first example was shot on the lonely beach frequented by the Maleos, described by Wallace in his 'Malay Archipelago.'

37. MACROPTERYX WALLACEI (Gould).

Macropteryx wallacei, Wald. *op. cit.* p. 45.

a. ♂. Menado.

b. ? ♀. Menado.

c–e. *Juv.* Menado.

f, g. ♂. Kema.

h. Kema.

Iris brown; bill black; feet blackish grey. Length 19–21 centims., wing 18·2–18·5. The young birds have the under surface marked irregularly with buff feathers, which are white at the base and tipped with brownish black. The tertials are white, and the primaries and secondaries strongly tipped with that colour. Native name *Pavas.*

38. COLLOCALLIA ESCULENTA (Linn.).

Collocallia esculenta, Wald. *op. cit.* p. 46.

a. ♂. Maros River, S. Celebes.
b. ♀. Talisse Island, N. Celebes.

Iris brown; bill and tarsus black. Length 9·5 centims., wing 9·7–10.

39. LYNCORNIS MACROPTERUS, Bp.

Lyncornis macropterus, Wald. *op. cit.* p. 47.

a, b. ♂. Pogoyama River, Gulf of Gorontalo.
c. ♀. Pogoyama River.
d. ♀. Menado.
e. Kema.

Iris brown; bill reddish brown; feet clear brown. Length 30–31·5 centims., wing 23·5–25·5. Native name *Trio.*

This species seemed abundant in the north of Celebes, especially near Likoupang.

40. CRANORRHINUS CASSIDIX (Temminck).

Cranorrhinus cassidix, Wald. *op. cit.* p. 47.

a. ♂. Likoupang.
b. ♂. N. Celebes.

Iris bright orange; feet black. Length of adult male about 104 centims.; weight 5 lb. 3 oz. Bill orange-yellow; the basal plaques dull red anteriorly; casque dull red; bare throat cobalt-blue, "marked with two patches of black and one of dark blue."

Specimen *a* has two maxillary and three mandibular basal plaques. In *b* the third or anterior mandibular plate is incomplete.

41. SCYTHROPS NOVÆ-HOLLANDIÆ, Latham.

Scythrops novæ-hollandiæ, Wald. *op. cit.* p. 51.

a. Kema.

Culmen smooth and rounded; the maxilla with two grooves, both of which, however, are shallow and ill-developed.

42. PHŒNICOPHAËS CALORHYNCHUS (Temminck).

Phœnicophaës calorhynchus, Wald. *op. cit.* p. 52.

a. ♀. Kema.
b. Kema.
c–e. ♂. Menado.
f–h. ♀. Menado.
i. Menado.

Iris reddish brown; bill white, black, yellow, and red from tip to base; lower mandible entirely red; tarsus black. Native name *Burong bakeke.* Length 51·0–53·0 centims.

43. Eudynamis melanorhyncha, S. Müller.

Eudynamis melanorhyncha, Wald. *op. cit.* p. 53.

a–e. Kema.
f–h. ♂. Menado.
i, k. ♀. Menado.
(All the above are in transition plumage.)
l. ♀. Menado.
m–p. ♂. Menado.
q. ♂. Tomohon.
r. ♀ *vix ad.* Talisse Island, N. Celebes.
(In the final stage of plumage.)

This series exhibits admirably the various phases of plumage through which this species passes. In the *first stage* the whole of the upper surface, wings, and tail are bright chestnut, clearly barred with black; the head streaked longitudinally with that colour. Beneath, the chin and throat are chestnut streaked with black; the rest of the under surface fulvous, barred with black; edge of wing white; moustache white.

Second stage.—Head and nape nearly black, with here and there a chestnut feather; upper surface more dusky black; bars broader and inclining to coalesce; primaries at tips brownish black.

Third stage.—Upper surface much as in the last, but darker; the chin and throat are brownish black.

Fourth stage.—Upper surface almost entirely greenish black, but the rufous and black barring still visible in some of the tail-feathers; under surface losing the barring and becoming dusky; edge of wing and moustache marked with brown.

Fifth stage.—All trace of the chestnut and black barring has disappeared; the tail is entirely greenish black; breast and abdomen dusky brown, washed with fulvous.

Sixth stage.—The greenish black of the upper surface is changing into bluish black; abdomen still darker; white moustache nearly gone.

Seventh stage.—Entirely blue-black; no moustache or white edge to wing; bill longer.

Iris in hepatic stage red or reddish brown; bill bluish black; tarsus slate. In the full plumage the iris is bright red; bill and feet black. Length 38·2–43·5 centims., wing 18·2–20·0. Native name, in hepatic phase *Kuku buri,* in mature plumage *Kouil.*

44. Cacomantis sepulchralis, S. Müller.

Cacomantis sepulchralis, Wald. *op. cit.* p. 116.

a, b. ♂. Menado.
c, d. ♀. Menado.

Iris "brown?"; bill black. In the immature bird the base of the lower mandible is probably yellowish. Tarsus yellow. Native name *Burong bantik.* Length of wing 11·3 centims., tail about 14·0.

I hesitate whether to refer these specimens to *C. sepulchralis* or to *C. lanceolatus.* Two are slightly immature; but in the others the chin, cheeks, throat, and forehead are ashy grey; the head iron-grey; upper surface bronze-green, shading off to brown on the primaries; under surface bright rufous; middle pair of rectrices blue-black, the others brownish black; all tipped with white.

45. CACOMANTIS TYMBONOMUS, S. Müller.

Cacomantis tymbonomus, Wald. *op. cit.* p. 54.

a. Juv. ♀. Menado.

I refer this bird to *C. tymbonomus* with great doubt. The upper surface and wing are olive-brown; rump greyish; head and cheeks brown, flecked with ferruginous; entire under surface greyish white, strongly barred with brown; tail with a subapical dark-brown band and white apex to each feather. This white tip is not as in the last species, prolonged up the shaft of the feather, but has the basal boundary straight. This individual has a larger beak, longer wings, and a shorter tail than the last species. Wing 12·7 centims., tail 11·6.

46. PYRRHOCENTOR CELEBENSIS (Q. & G.).

Pyrrhocentor celebensis, Wald. *op. cit.* p. 55.

a–c. ♂. Menado.
d–f. Kema.
g. Likoupang, N. Celebes.
h. Menado.

47. CENTROCOCCYX AFFINIS (Horsfield).

Centrococcyx affinis, Wald. *op. cit.* p. 56.

a. ♂. Limbe Island, N. Celebes.
b. ♂. Menado.
c. ♀. Menado.

Iris brown; bill and feet slate-coloured. Length 37·2 centims., wing 15·5–17·5. Native name *Kuluket.*

48. CUCULUS CANORUS, Linn.

Cuculus canorus, Wald. *op. cit.* p. 115.

a. ♀. Kema.
b. Kema.

Iris brownish yellow; bill—upper mandible dark bluish black, lower dull greenish yellow with black tip; tarsus yellow.

Cannot be distinguished from European skins in plumage. Wing in *a* 19·0 centims., tail 17·0. Wing in *b* 21·1 centims., tail 18·0.

49. ORIOLUS CELEBENSIS (Wald.).

Broderipus coronatus, Wald. *op. cit.* p. 60.

a–d. ♂. Menado.
e–h. ♀. Menado.

i–l. Kema.

m. ♂. Kema.

n. ♀. Maros, S. Celebes.

Iris red; bill pink; tarsus bluish black. Length about 26·5 centims., wing 13·4–14·0. Native name *Burong koning.*

In two females from Menado the bill, though noted as pink, has dried black. These two birds have the coronal ring incomplete. The amount of black towards the apices of the two median rectrices I believe to bear no relation whatever to the age of the bird. It varies considerably; but many of the Orioles show a tendency to variation in the disposition of the yellow and black.

50. Geocichla erythronota, Sclater.

Geocichla erythronota, Wald. *op. cit.* p. 61.

a. ♂. Menado.

I have no note of the measurements or soft parts, the only specimen I obtained being shot by my hunter at Menado during my absence. The native name is *Moupu burik.*

51. Turdinus celebensis (Strickland).

Trichostoma celebense, Wald. *op. cit.* p. 62.

a. ♀. Menado.

Native name *Terrek.*

52. Pitta celebensis, Forsten.

Erythropitta celebensis, Wald. *op. cit.* p. 62.

a. ♂. Menado.

Iris ruddy brown; bill brownish black; feet pinkish slate. Native name *Mupu sava merah.*

53. Anthus gustavi, Swinhoe.

Corydalla gustavi, Wald. *op. cit.* p. 117.

a. Kema.

54. Budytes viridis (Gm.).

Budytes viridis, Wald. *op. cit.* p. 65.

a. Kema.

A specimen entirely ashy-grey on the upper surface; rump olive-yellow; throat white; rest of under surface pale yellow; superciliary streak inconspicuous, yellowish white. No date.

55. Hirundo javanica, Sparrm.

Hirundo javanica, Wald. *op. cit.* p. 66.

a. ♂. Menado, Sept. 6.

Iris brown; bill and feet black. Length 13·0 centims., wing 10·5.

56. Myialestes helianthea (Wallace).

Myialestes helianthea, Wald. *op. cit.* p. 66.

a. ♂. Limbé Strait, N. Celebes.

Iris brown; bill yellowish brown; tarsus flesh-coloured.

57. Hypothymis puella, Wallace.

Hypothymis puella, Wald. *op. cit.* p. 66.

a, b. Juv. ♂. Menado.
c. ♀. Menado.
d. ♀. Limbé Straits.
e, f. Kema.
Iris brown; bill bluish black; feet blue.

58. Artamus monachus, Temminck.

Artamus monachus, Wald. *op. cit.* p. 67.

a. ♀. Near Menado.

59. Artamus leucorhynchus (Linn.).

Artamus leucorhynchus, Wald. *op. cit.* p. 67.

a. ♂. Menado.
b. ♀. Menado.
The Celebes birds resemble some I have from Sumbawa, in the grey of the throat being not so sharply defined as it is in Philippine and Bornean birds. The amount of white on the rump in the former also appears more restricted than in the latter.

60. Graucalus leucopygius, Bp.

Graucalus leucopygius, Wald. *op. cit.* p. 68.

a, b. ♂. Menado.
c. ♀. Menado.
d, e. ♀. Gorontalo.
f. ♀. Talisse Island, N. Celebes.
Iris brown; bill and tarsus black. Length about 28 centims., wing 15·5. Native name *Koukou inewahat*. The female is paler than the male, is without the black lores, and has the white on the rump more extensively diffused.

61. Edoliisoma morio (S. Müller).

Volvocivora morio, Wald. *op. cit.* p. 69.

a. ♂. Kema.
b. ♀. Kema.
c. Juv.? Kema.
d, e. ♂. Menado.
Iris brown; bill and feet black. Length about 25 centims., wing 12. Native name *Toktok ruoit*.

I am inclined to think that the plumage of the young male is very nearly identical with that of the adult female. In *c*, which is marked "sex. incert." on the label, the under surface shows evident signs of turning grey, and in *e*, marked "♂, Menado," the bird is evidently immature from the amount of ochraceous edging to the wing-feathers.

62. Lalage leucopygialis, Gray.

Lalage leucopygialis, Wald. *op. cit.* p. 69.

a. ♂. Menado.
b. ♀. Menado.
c. Kema.
Iris brown; bill and feet black. Length 18 centims., wing 9·5.

63. Chibia leucops (Wallace).

Dicrurus leucops, Wald. *op. cit.* p. 70.

a–e. ♂. Menado.
f, g. ♀. Menado.
h. ♂. Tomohon.
Iris white; bill and feet black. Length about 30 centims., wing 15·4–16·1. These examples differ a good deal in the size and colouring of the gular metallic spots, and I feel sure no reliance can be placed on this characteristic for help in diagnosis in this genus. One example, a male from Menado, exhibits a single long bristle springing from the forehead, as in *C. pectoralis*. In none of the others is there any sign of it. Native name *Burong gunting*.

64. Anthothreptes celebensis (Shelley).

Anthreptes malaccensis, Wald. *op. cit.* p. 70.

a–c. ♂. Menado.
d, e. ♂. Gorontalo.
f. Juv. ♂. Maros River.
Iris red-brown; bill and feet brownish black. Native name *Burong Tjui*.

65. Cinnyris frenata (S. Müller).

Arachnecthra frenata, Wald. *op. cit.* p. 71.

a. ♂. Kema.
b, c. ♂. "Celebes."
d. ♀. Gorontalo.
e. ♂. Menado.
f. ♂. Marchesa Bay, Gulf of Gorontalo.
Iris brown; bill and tarsus black. Native name *Tjui koning*.

66. Cinnyris grayi (Wallace).

Nectarophila grayi, Wald. *op. cit.* p. 71.

a–c. ♂. Kema.

67. Æthopyga flavostriata (Wallace).

Æthopyga flavostriata, Wald. *op. cit.* p. 71.

a. ♂. Near Menado.
Native name *Tjui merah*.

68. Dicæum celebicum, S. Müller.

Dicæum celebicum, Wald. *op. cit.* p. 72.

a. ♂. Tomohon.

b. ♂. Tondano.
c. Kema.
Iris reddish; bill and feet brownish black.

69. PRIONOCHILUS AUREOLIMBATUS, Wallace.

Prionochilus aureolimbatus, Wald. *op. cit.* p. 72.

a. ♀. Tomohon.
b. ♀. Tondano.
Iris brown; bill and feet black. This species does not seem to be found except in the mountain district.

70. ZOSTEROPS INTERMEDIA, Wallace.

Zosterops intermedia, Wald. *op. cit.* p. 72.

a. ♀. Maros River, S. Celebes.

71. MUNIA MOLUCCA (Linnæus).

Munia molucca, Wald. *op. cit.* p. 73.

a, b. ♂. Kema.
Iris brown; bill and legs bluish black. Length 11·7 centims., wing 5. In small flocks, feeding in the grass.

72. CORONE ENCA (Horsfield).

Corvus enca, Wald. *op. cit.* p. 74.

a, b. ♂. Menado.
c. ♀. Menado.
Wing, length 26·5–28·5 centims.; culmen 5·0–5·5. By these measurements it would appear that the Celebean bird is smaller than those from Java, Sumatra, and Borneo (*vide* Cat. B. vol. iii. p. 43). Native name *Woka-woka*.

73. STREPTOCITTA TORQUATA (Temminck).

Streptocitta torquata, Wald. *op. cit.* p. 76.

a–e. Kema.
f. ♂. Menado.
g, h. ♀. Menado.
i, k. ♂. Likoupang.
l. ♂. Lotta (mountain district).
m. ♂. Maim Bay, N. Celebes.
n, o. ♂. Gorontalo.
Iris brown; bill and legs black. Native name *Burong pandita*: *i. e.* the parson bird, so called from the black plumage and white collar.

74. BASILEORNIS CELEBENSIS, Temminck.

Basileornis celebensis, Wald. *op. cit.* p. 77.

a. ♂. Menado.
b. Kema.
Native name *Rajah siëk*. This species is apparently far from common in the north of Celebes.

75. Acridotheres cinereus, Müller.

Acridotheres cinereus, Wald. *op. cit.*

a, b. ♂. Maros River, S. Celebes.

Iris brownish orange; bill red-orange; feet yellow. Length 26 centims., wing 13.

I have never observed this bird in North Celebes.

76. Calornis neglecta, Walden.

Calornis neglecta, Wald. *op. cit.* p. 79.

a. ♂. Talisse Island, N. Celebes.

Iris brilliant orange-red; bill and tarsus black. Length 22·5 centims., wing 10·7; bill—culmen 2·2, from nostril 1·5, from gape 2·9; tail 9. Of a uniform dull metallic green.

Talisse Island is five or six miles off the extreme north point of Celebes.

77. Scissirostrum dubium (Latham).

Scissirostrum dubium, Wald. *op. cit.* p. 81.

a, b. ♂. Menado.
c, d. ♀. Menado.
e–g. Menado.

Iris reddish; bill bright orange; tarsus orange. Native name *Siëk.* Extremely abundant in flocks of about twenty individuals in the fruit-gardens round Menado, uttering noisy cries, and fighting at the tops of the trees.

78. Osmotreron griseicauda (G. R. Gray).

Osmotreron griseicauda, Wald. *op. cit.* p. 82.

a, b. ♂. Kema.
c. ♀. Kema.

79. Ptilopus formosus, G. R. Gray.

Lamprotreron formosa, Wald. *op. cit.* p. 82.

a–d. ♂. Menado.
e–g. Juv. ♂. Menado.
h, i. ♀. Menado.

Iris yellow; bill green; tarsus coral. Length 24·5 centims., wing 13·2–13·6. Native name *Wakiam pongot.*

80. Ptilopus melanocephalus, Gm.

Iotreron melanocephala, Wald. *op. cit.* p. 83.

a. ♂. Menado.
b. ♀. Menado.
c. Juv. ♂. Menado.
d. ♂. Talisse Island, N. Celebes.
f–h. ♂. "Celebes."
i, k. ♀. "Celebes."

Iris in male yellow; bill olive-green; tarsus coral. Length 22·5–23 centims.

81. Carpophaga paulina, Temminck.

Carpophaga paulina, Wald. *op. cit.* p. 83.

a–f. ♂. Talisse Island, N. Celebes.
g. ♀. Talisse.
h. "Celebes."
i, k. ♂. Menado.
l. ♀. Menado.
m. ♀. Pogoyama River, Gulf of Gorontalo.
n. ♂. Likoupang, N. Celebes.
o. ♀. Likoupang.

Iris indian-red; tarsus red; bill in male bluish green, with a red patch at the base of the upper mandible. The female is without this. Weight about 19 oz. Length 37·5–42·1 centims., generally about 40; wing 21·5–23. Native name *Kum-kum*.

The bird was very common on Talisse Island, but there are no differences between skins from that locality and the mainland. There is no sexual difference, with the exception of the colouring of the beak already alluded to; but it is noticeable that some birds have a very marked reddish-copper gloss on the upper surface, while in others the strong green reflections are almost destitute of this colour.

82. Carpophaga radiata, Q. et G.

Zonœnas radiata, Wald. Tr. Z. S. vol. viii. pt. 2, p. 84.

a, b. ♂. Menado.
c–f. ♀. Menado.
g. Juv. ♀. Menado.
h. ♂. Maros River.
i. ♂. Talisse Island, N. Celebes.
k. ♀. Kema.

Iris, outer ring red, inner yellow; bill brownish black; tarsus dull red. Length 35·5–36·5 centims., wing 20–21·2. Native name *Takura*. Some examples tend to bright coppery reflections, others to shining green, without reference to sex. The young bird is without the blue-black nuchal band, but a few of the reddish-purple feathers are beginning to appear; the head is fulvous, washed with greyish green; upper breast tawny; bar on the tail narrow and ill-defined.

83. Myristicivora luctuosa (Reinw.).

Myristicivora luctuosa, Wald. *op. cit.* p. 84.

a. ♂. Maim Bay, N. Celebes.
b, c. ♀. Maim Bay.
d. ♀. Kema.

Iris dark brown; bill bluish green, yellow at the tip; tarsus bluish green. Length about 43 centims., wing 23·3–24·4.

All the specimens have 14 tail-feathers; the external pair are white to the very apex, but have a narrow edging of black on the outer web.

84. Myristicivora bicolor (Scopoli).

a. ♂. N. Celebes.

Iris brown. Length 42·5 centims., wing 23·4. In a series obtained from Gilolo, the Weda Islands, and Sulu, the amount of terminal black on the external pair of rectrices differs considerably.

85. Macropygia albicapilla, Temminck.

Macropygia albicapilla, Wald. *op. cit.* p. 85.

a. ♂. Menado.
b. ♀. Likoupang.
c, *d. Juv.* ♀. Menado.
e. Juv. ♀. Maros River.
f. Juv. ♂. Maros River.

Iris in adult violet, with an outer ring of flesh-colour; bill black; tarsus coral. Length about 35·5 centims., wing 15·5–15·8. Native name *Kuwon.* Examples *e* and *f* correspond somewhat closely to the description of *M. macassariensis*, but I am inclined to regard them as the young of *M. albicapilla.*

86. Turacœna menadensis (Q. et G.).

Turacœna menadensis, Wald. *op. cit.* p. 85.

a–c. Kema.
d. ♂. Menado.
e. ♀. Menado.

Native name *Kapala putih*, *anglice* white head.

87. Spilopelia tigrina (Temminck).

Turtur tigrina, Wald. *op. cit.* p. 85.

a. ♂. Menado.
b–d. ♀. Menado.
e. ♀. Talisse Island, N. Celebes.

Iris brown; bill brown-black; tarsus pinkish. These examples do not differ from birds from Sumbawa, except that in the latter the iris is pale yellow. Native name *Torkuku.*

88. Chalcophaps indica (Linn.).

Chalcophaps indica, Wald. *op. cit.* p. 86.

a–c. Kema.

These examples differ in the amount of white on the forehead. Thus in one it extends to behind the vertex, while in another it merely forms two supraorbital lines running backwards from the base of the upper mandible.

89. Calœnas nicobarica (Linn.).

a. ♀. Amoerang Islands.

Iris dull red; bill black; tarsus dark coral. This bird was bought alive at Menado, and was said to have been caught on the Amoerang Islands, to the west of Menado.

90. Megapodius gilberti, G. R. Gray.

Megapodius gilberti, Wald. *op. cit.* p. 87.

a. N. Celebes.

91. Megacephalon maleo, Temminck.

Megacephalon maleo, Wald. *op. cit.* p. 87.

a–h. ♂. Wallace Bay, N. Celebes.
i–m. ♀. Wallace Bay, N. Celebes.
n. Near Menado.

Iris brown; bill pea-green, darker at base; culmen red; casque black; bare throat dark brown; feet and tarsus grey, claws yellow. Length 57·5–60 centims., the female being slightly the smaller. The weight of six different males only varied 2 oz.—from 3 lb. 6 oz. to 3 lb. 8 oz. Two females weighed 3 lb. 5 oz. and 3 lb. 7 oz. respectively; but two others (one of which had an egg ready for immediate extrusion, and another of which I have no record) weighed 3 lb. 14 oz. The male generally has a somewhat larger casque, and is a little brighter.

These birds were very abundant at the beginning of September on the lonely beach mentioned by Mr. Wallace in his 'Malay Archipelago.' The members of our party shot no less than 42 in two days. They are to be seen working in pairs or small flocks, never singly, and the digging continued all day, from sunrise to sunset. I am inclined to think that they may lay as many as twenty eggs in the season, as in some of the females I dissected there were about that number of ova, ranging from the size of a large pea upwards. There is a great difference in size between the egg just ready for extrusion and the next; the latter being not larger than a shilling. Two eggs I have measure respectively $10{\cdot}2 \times 6{\cdot}2$ and $10{\cdot}4 \times 6{\cdot}3$ centims.

92. Charadrius fulvus, Gm.

Charadrius fulvus, Wald. *op. cit.* p. 88.

a. Gorontalo, September 25th.

93. Ægialitis geoffroyi (Wagl.).

a. Kema.

A specimen in summer plumage. Lord Walden does not include this species in his list of Celebes birds, but it has been recorded from that island by Meyer.

94. Himantopus leucocephalus, Gould.

Himantopus leucocephalus, Wald. *op. cit.* p. 91.

a–c. ♂. Limbotto Lake.
d. ♀. Limbotto.

Iris yellow; bill black; legs bright red. Length 37·5 centims. Shot at the end of September.

95. Porphyrio indicus, Horsf.

Porphyrio indicus, Wald. *op. cit.* p. 92.

a. ♂. Limbotto Lake.

Iris pinkish red; frontal plate brilliant red, bill darker; legs and feet pink, brown at the joints.

96. Hydralector gallinaceus (Temm.).

Hydralector gallinaceus, Wald. *op. cit.* p. 92.

a. ♂. Limbotto Lake.

Iris yellowish brown; bill black at tip, dirty yellowish at base; comb reddish yellow; feet and tarsus olive-slate. Length 20·2 centims.; wing 11·8 centims. Shot at end of September.

97. Gallinula frontata, Wallace.

Gallinula frontata, Wald. *op. cit.* p. 93.

a. ♂. Limbotto Lake.

Iris reddish; frontal shield orange-red; bill darker red, yellow at tip; tarsus red, olive-green at the joints.

98. Erythra phœnicura (Forsten).

Erythra phœnicura, Wald. *op. cit.* p. 94.

a, *b*. ♂. Menado.

c. ♀. Menado.

d. Kema.

These birds resemble an example of *E. leucomelæna* from Sumbawa in having the forehead black, or very nearly so. Three have black feathers on the cheeks. The length of an adult male is 29·4 centims. Native name *Sarem wokwok*.

99. Hypotænidia celebensis (Q. et G.).

Hypotænidia celebensis, Wald. *op. cit.* p. 95.

a, *b*. ♂. Menado.

c. ♀. Menado.

d. ♀. Kema.

Native name *Werries*.

100. Hypotænidia philippensis (Linn.).

Hypotænidia philippensis, Wald. *op. cit.* p. 95.

a. ♂. Menado.

b. ♀. Menado.

Native name *Werries imbene*.

101. Numenius uropygialis, Gould.

Numenius phæopus, Wald. *op. cit.* p. 96.

a, *b*. Kema.

c. ♀. Talisse Island, N. Celebes.

102. Tringoides hypoleucos (Linn.).

Actitis hypoleucos, Wald. *op. cit.* p. 96.

a. Kema, no date.

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103. Totanus glareola (Linn.).

Actititis glareola, Wald. *op. cit.* p. 97.

a. Kema, no date.

104. Totanus calidris (Linn.).

Totanus calidris, Wald. *op. cit.* p. 97.

a. Kema, no date.

105. Ardeola leucoptera, Bodd.

Ardeola speciosa, Wald. *op. cit.* p. 98.

a. ♂. Limbotto Lake.

In full plumage. Iris yellow; bill yellowish green, black at tip and with base of culmen reddish brown; tarsus and feet greenish yellow.

106. Ardetta sinensis (Gm.).

Ardetta sinensis, Wald. *op. cit.* p. 99.

a. ♂. Limbotto Lake.
b. Kema.

107. Demiegretta sacra (Gm.).

Demiegretta sacra, Wald. *op. cit.* p. 100.

a. Kema.
b. ♀. Maim Bay, N. Celebes.

This species was extremely abundant at the mouths of streams in N. Celebes, and white varieties appeared not uncommon.

108. Butorides javanica (Horsf.).

Butorides javanica, Wald. *op. cit.* p. 100.

a, ♂ (full plumage). Kema.
b, c. ♂ *juv.* Kema.
d. ♂. Menado.
e. ♀. Menado.

2. Report on the Collection of Birds obtained during the Voyage of the Yacht 'Marchesa.'—Part V. The Molucca Islands. By F. H. H. Guillemard, M.A., M.D., F.L.S., &c.

[Received May 27, 1885.]

(Plate XXXIV.)

The 'Marchesa,' after leaving the Gulf of Gorontalo in Celebes, proceeded to the Moluccas, and remained some time at Ternate, whence a visit was paid to the neighbouring island of Halmaheira, better known to the English as Gilolo. Proceeding southwards again, the large island of Batchian was touched at with the view of procuring coal, and a considerable number of birds were obtained, including examples of *Semioptera wallacei*. From here a visit of a few days was paid to the little-known and uninhabited Obi group. Owing, however, to the thoroughness of Bernstein's work in this locality, no new species were obtained. Before leaving for the Papuan islands the 'Marchesa' visited the Weeda group, a new locality hitherto unexplored by naturalists, lying to the eastward of the southern peninsula of Halmaheira. Here the only novelty procured by the party in the Moluccas was met with, an *Eos* closely allied to *E. riciniata*.

A total of sixty-nine species was collected in the Moluccas, a list of which is here given. The arrangement adopted in Salvadori's 'Ornitologia della Papuasia e delle Molucche' has been followed throughout.

1. Cuncuma leucogaster (Gm.).

Cuncuma leucogaster, Salvad. Ornitologia della Papuasia e delle Molucche, vol. i. p. 7.

a. ♂. Obi Major.

Iris marbled, yellowish; bill bluish horn; feet grey.

Somewhat common in the Moluccas, frequenting the sea-shore.

2. Haliastur intermedius, Gurney.

Haliastur intermedius, Salvad. *op. cit.* vol. i. p. 19.

a. Obi Major.

3. Tinnunculus moluccensis, Schleg.

Tinnunculus moluccensis, Salvad. *op. cit.* vol. i. p. 37.

a. ♀. Batchian.

Iris brown; bill slate; nasal sheath and feet yellow, claws black. Length 35·8 centims., wing 22·9.

4. Cacatua alba (Müll.).

Cacatua alba, Salvadori, *op. cit.* vol. i. p. 99.

a. ♂. Batchian village, Batchian.
b. ♀. Batchian village.
c. ♂. Bisa I., Obi group.

Iris of the Batchian birds blue; of the Obi example red. Bill and legs black. Length of wing 27·0–28·0 centims. In all the above individuals the bare space round the eye was yellowish. This species has the same habits as the representative *C. triton* of the Papuan islands, screaming noisily at sunset round the tops of the highest trees. *C. alba* has not previously been recorded from the Obi group, where it appears to be somewhat scarce.

5. Tanygnathus megalorhynchus (Bodd.).

Tanygnathus megalorhynchus, Salvad. *op. cit.* vol. i. p. 129.

a. ♂. Weeda Islands, S.E. Halmaheira.

Iris whitish yellow; bill scarlet; tarsus dull olive-green. Length 42 centims.; wing 24 centims.

6. Geoffroyus cyanicollis (S. Müll.).

Geoffroyus cyanicollis, Salvad. *op. cit.* vol. i. p. 191.

a–c. ♂. Batchian.
d–g. ♀. Batchian.
h, i. ♂, *juv.* Batchian.
k, l. ♂. Sidangoli, Halmaheira.
m–o. ♀. Sidangoli.

Iris pale yellow; bill black, maxilla of ♂ red; feet dull olive-green. Length 28·2–29·5 centims.; wing 17·0–18·2 centims. The Halmaheira birds have the head much brighter than those from Batchian, and in the female the collar is of a lighter blue, as are also the under wing-coverts. In the series of over fifty examples in Salvadori's collection only one, and that a female, is from Batchian. It appears to me, however, that a larger series might prove the birds from the latter locality to be separable. It is worthy of remark that in the individuals *h, i* the feathers of the back and uropygium are red-brown, as is the case in *G. obiensis*. Neither bird is, however, in quite mature plumage.

7. Geoffroyus obiensis (Finsch).

Geoffroyus obiensis, Salvad. *op. cit.* vol. i. p. 193.

a. ♂. Obi Major.
b, c. ♀. Obi Major.

Iris yellow; bill black, maxilla in ♂ red; feet olive-grey. Size rather smaller than *G. cyanicollis*.

The red-brown rump has been given as the distinguishing characteristic of this species, but, as already noticed, it was also present in two examples of *G. cyanicollis* from Batchian. Salvadori does not mention, however, what seems to be a marked feature of distinction between the two species. In the male of *G. obiensis* the blue of the head does not pass backward much beyond the vertex; it ends abruptly, and the occiput is bluish-green. In like manner in the female the bluish-brown is confined to the vertex, and the dark mask thus extends to a very short distance only behind the eye.

8. Eclectus roratus (P. L. S. Müll.).

Eclectus roratus, Salvad. *op. cit.* vol. i. p. 206.

a–d. ♂. Batchian. (Length 40·7–41·0 centims.; wing 27·0–27·3 centims.)
e–k. ♀. Batchian. (Length 38·2–43·0 centims.; wing 24·5–6·1 centims.)
l, m. ♀. Ternate.

Iris yellow in both sexes in the Batchian birds. Bill of female black; bill of male rosy red, yellowish at the tip; mandible black; tarsus black or dirty brown.

These birds, though caught and kept in confinement in considerable numbers, appear rarely to get tame, and I have never heard them talk.

9. Lorius domicella (Linn.).

Lorius domicella, Salvad. *op. cit.* vol. i. p. 236.

a–c. ♂. Obtained alive at Amboina.
d. ♀. Obtained alive at Amboina.

One of these birds exhibits the well-known tendency of many of the Parrot tribe to turn yellow in confinement. The wings, under wing-coverts, scapulars, back, and uropygium are more or less marked with that colour, and the yellow pectoral band is also more conspicuous than usual.

10. Lorius flavo-palliatus, Salvad.

Lorius flavo-palliatus, Salvad. *op. cit.* vol. i. p. 243.

a, b. ♂. Batchian.
c. ♀. Batchian.
d. Batchian.
e, f. ♂. Obi Latu.
g. ♂. Obi Major.
h. ♀. Obi Major.

Iris of the Batchian birds yellow or orange; of the Obi birds yellowish brown. Bill orange; feet greyish black.

With the exception of the different colour of the iris, there is no noticeable difference between the birds from the Obi group and from Batchian.

11. Eos riciniata (Bechst.).

Eos riciniata, Salvad. *op. cit.* vol. i. p. 259.

a, b. ♂. Ternate.
c–f. ♀. Ternate.
g. ♂. *juv.* Ternate. (Bill brownish red.)
h. ♀, *juv.* Ternate. (Bill brownish red.)
i–l. ♂. Batchian.
m–q. ♀. Batchian.
r. ♂. Obi Major.

Iris yellow; bill dull red, yellow at tip; tarsus dull grey. The example marked *r* was the only one obtained from the Obi group, and differs considerably from all the others in having the head, throat, and breast entirely red. There is no violet nuchal collar, a few feathers only on the nape being tipped with that colour. Immediately below the auricular region on each side is a small patch of dull violet. The total length was 25·0 centims.; wing 13·8 centims.; which measurements agree with those of the rest of the series (length 23·0–25·5 centims.; wing 13·6–14·3 centims.). With regard to the variation of this species, Salvadori informs us that "in the Leyden Museum an adult Obi bird, another from Dammar, and a third from Moor" (island to the S. of Halmaheira) "are noteworthy in having an occipital violet spot separated by a red space from the violet collar; others from Dammar (No. 31) and Moor (No. 33) are exactly like ordinary individuals from Halmaheira and Batchian."

12. Eos INSULARIS, sp. nov. (Plate XXXIV.)

E. riciniatæ *similis, sed major, lætior, ac iride rubra; maculâ violaceâ occipitis cum fasciâ cerviculi ejusdem coloris haud confluente, sed torque rubro separata.*

a. ♂. Weeda Islands, S.E. Halmaheira. (Length 27·2; wing 15·2 centims.)

b. ♂. Weeda Islands, S.E. Halmaheira. (Length 26·5; wing 13·8 centims.)

c. ♂. Weeda Islands. S.E. Halmaheira. (Length 27·2; wing 14·6 centims.)

d. ♂. Weeda Islands, S.E. Halmaheira. (Length 27·3; wing 14·4 centims.)

e. ♀. Weeda Islands, S.E. Halmaheira. (Length 27·2; wing 14·6 centims.)

Iris red; bill orange, yellow at the tip; feet black.

This species much resembles *E. riciniata,* but differs in the following particulars. The occipital violet patch is very small, and is separated from the nuchal collar by a broad band of red. Both the nuchal and pre-pectoral violet collars are small, and the violet of the abdomen does not pass upwards on to the breast, thus leaving a broad red pectoral band. The iris is red, thus differing from *E. riciniata,* in which it is yellow; and lastly, the latter species is of markedly smaller size, as will be seen on a comparison of the measurements.

The individuals of the present series are alike, except that in one the occipital spot is partially connected with the nuchal collar. The bird, however, is apparently moulting.

The Weeda Islands are a coral group hitherto unvisited by any naturalist, lying to the east of the extreme south point of Halmaheira or Gilolo. They are not to be confounded with the village of Weeda on the mainland of Halmaheira.

13. CORIPHILUS PLACENS (Temm.).

Coriphilus placens, Salvad. *op. cit.* vol. i. p. 303.

a. ♂. Sidangoli, Halmaheira.

b. ♀. Sidangoli.

Iris yellow; bill and feet bright red. Male, length 18·8, wing 9·4 centims.; female, length 19·2, wing 9·2 centims.

14. CUCULUS CANOROIDES, S. Müll.

Cuculus canoroides, Salvad. *op. cit.* vol. i. p. 328.

a. ♂. Weeda Islands, S.E. Halmaheira.

b. ♀. Weeda Islands.

Iris brown, greyish in the female; bill black, lower mandible green at base; feet bright yellow. Length of male 32·8 centims., wing 19·5; of female 29·5 centims., wing 18·8. Shot October 16th.

Both examples are in imperfect plumage, with the feathers of the upper surface greyish brown margined with white.

15. NESOCENTOR GOLIATH (Forsten).

Nesocentor goliath, Salvad. *op. cit.* vol. i. p. 382.

a. ♂. Batchian.

Iris red; bare circumocular skin blue; bill, feet, and tarsus black. Contrary to what might be expected, this species does not appear to have the habits of the Ground Cuckoos, as it frequents the forest, and perches frequently on high trees.

16. RHYTIDOCEROS PLICATUS (Penn.).

Rhytidoceros plicatus, Salvad. *op. cit.* vol. i. p. 392.

a. ♂. Batchian.

Iris orange-yellow; bill light yellow; reddish at base; bare skin of throat and round eye pale blue; tarsus black. Length 86·0 centims.

An example fully adult in plumage, but probably not an old bird, as the bill is but little jagged at the edges, and the maxilla is furnished with two plaques only, which are very large. The intervening sulcus is hardly existent in the median line.

17. MEROPS ORNATUS, Lath.

Merops ornatus, Salvad. *op. cit.* vol. i. p. 401.

a, *b*. ♂. Ternate.

c–e. ♀. Ternate.

Shot in the beginning of October.

18. ALCEDO MOLUCCENSIS, Blyth.

Alcedo ispidoides, Salvad. *op. cit.* vol. i. p. 408.

a. ♂. Batchian.

b. ♀. Batchian.

c. ♂. Obi Major (legs flesh-coloured).

Iris brown; bill black, the female with the base of the lower mandible orange; tarsus coral-red.

The Obi bird is extremely small, as may be seen from the following measurements:—

	Length.	Wing.	Bill.
♀. Batchian	18·5	7·3	5·1
♂. Obi Major......	14·5	7·1	4·5

The under surface is very dark rufous, especially on the breast, where the tips of the feathers are tinged with blue. From the appearance of the bill, which was whitish at the tip, and from the colour of the legs, it is probable that the bird is immature, but the colours of the upper surface are very bright.

19. ALCYONE PUSILLA (Temm.).

Alcyone pusilla, Salvad. *op. cit.* vol. i. p. 414.

a. ♂ *juv.* Weeda Islands, S.E. Halmaheira.

Iris brown; bill black; legs dull flesh-colour, not brown as in the adult. Length 11·8 centims., wing 5·0, bill from gape 3·1.

The head of this bird is black, barred with light blue, and the upper surface generally is very dull blue. It was shot on the sea-shore while engaged in hunting for small crustacea, &c.

Examples from the N. Australian region seem brighter than those from the Moluccas and Northern New Guinea.

20. Ceyx lepida, Temm.

Ceyx lepida, Salvad. *op. cit.* vol. i. p. 417.

a. ♂. Ternate.

Iris brown; bill and tarsus bright scarlet. Length 16·3 centims.

Wallace speaks of this beautiful species as being abundant in the Moluccas, but I do not think that I met with it half a dozen times during my visit.

21. Tanysiptera margarethæ, Heine.

Tanysiptera margaritæ, Salvad. *op. cit.* vol. i. p. 430.

a. Batchian.

Crown of head much *maillée* in appearance. Spatulæ small, the blue of the shaft of the feather partially invading them.

22. Tanysiptera obiensis, Salvad.

Tanysiptera obiensis, Salvad. *op. cit.* vol. i. p. 433.

a–h. ♂. "Obi group."
i. ♀. "Obi group."
k–m. ♂. Obi Major.
n. ♂ *juv.* Obi Major.
o–q. ♀. Obi Major.
r. ♂. Bisa Isand, Obi group.
s. ♀. Bisa Island.

Head brilliant ultramarine, uniform, but on the nape inclining to cobalt. Cheeks, ear-coverts, sides and back of neck, and upper part of back and scapulars deep indigo. Lesser wing-coverts bright ultramarine; quills brownish black, the inner webs white at the base; lower portion of back and tail-coverts pure white, the latter in some examples tipped with dark blue; rectrices white, margined with blue on the outer web; the median pair very long, dark ultramarine, often marked irregularly with white on the inner webs; spatulæ white, sometimes slightly bordered on the outer web with blue. Entire under surface creamy white. Bill scarlet; iris brown; feet yellowish green. Length in full plumage about 40·0 centims. or even longer; middle rectrices 19·0–23·0 centims.; wing 10·9–11·4 centims.; bill from gape 5·0 centims.

The immature bird has the entire under surface rufous, each feather being black at the base and edges, giving a scaly appearance. The upper tail-coverts are tawny white, deeply bordered with black. The wing-coverts are bordered with rufous. The tail-feathers are bluish black above, greyish black below; the median pair, projecting about an inch beyond the others, are entirely bluish black including the spatula, which has only a small central patch of white.

23. Tanysiptera dea (Linn.).

Tanysiptera dea, Salvad. *op. cit.* vol. i. p. 436.

a. Amboina.

24. Halcyon diops, Temm.

Cyanalcyon diops, Salvad. *op. cit.* vol. i. p. 462.

a–d. ♂. Ternate.
e–g. ♀. Ternate.
h, i. ♂. Batchian.
k, l. ♀. Batchian.
m. ♂ *juv.* Batchian.

Iris brown; bill and feet black. Length about 21 centims., wing 8·8–9, bill from gape 4·9–5·3.

This species was apparently very abundant in Ternate.

25. Sauropatis saurophaga (Gould).

Sauropatis saurophaga, Salvad. *op. cit.* vol. i. p. 468.

a, b. ♀. Weeda Islands, S.E. Halmaheira.
c. Weeda Islands.

Iris brown; bill as in *S. chloris,* with the base of the lower mandible white; feet brownish black. Length 26–28·1 centims., wing 11·5–13·2, bill from gape 7·1.

The bluish or greenish shade observable in this species is apparently in no way connected with the sex or locality. Salvadori has shown that the title of *S. albicilla* should be confined to the representative species of the Marianne and Pelew archipelagos.

26. Sauropatis chloris (Bodd.).

Sauropatis chloris, Salvad. *op. cit.* vol. i. p. 470.

a–c. ♂. Batchian.
d. ♀. Bisa Island, Obi group.

Iris dark brown; bill black, whitish at base of lower mandible; feet dirty olive-brown.

27. Sauropatis sancta (Vig. et Horsf.).

Sauropatis sancta, Salvad. *op. cit.* vol. i. p. 476.

a. ♂. Ternate.
b. ♀. Batchian.
c. ♂. Weeda Islands, S.E. Halmaheira.

Iris brown; bill as in *S. chloris*; feet dull green. Length 20·9–21·1 centims. Example *b* is probably not fully adult, being very white beneath, with the feathers of the breast finely tipped with brown.

28. Eurystomus orientalis (Linn.).

Eurystomus orientalis, Salvad. *op. cit.* vol. i. p. 508.

a, b. ♂. Ternate.
c. ♀. Batchian.

Two of the above have the pallor of the more eastern race, which is by Salvadori and others regarded as a distinct species under the name *E. pacificus.* The third, a male from Ternate, is darker, and of the occidental type. An examination of a series of skins from Malacca eastwards to New Guinea shows such a gradual shading of the western into the eastern form, that they appear to me to be hardly separable. Schlegel only admits one species; and Salvadori, though considering *E. pacificus* to be distinct, says, "The differences are not very conspicuous, and are evident only when a great number of individuals of the two species are examined." The size of the bill appears to vary considerably.

29. Eurystomus azureus, G. R. Gr.

Eurystomus azureus, Salvad. *op. cit.* vol. i. p. 512.

a. ♂. Batchian.

Iris red-brown (?); bill bright coral; feet red. Length about 35·0 centims., wing 20·4, tail 12·5, bill from gape 4·5, culmen 4·4, width 3·1, tarsus 1·7.

An example of this beautiful bird was shot near the village of Batchian in the month of December. It was regarded by the natives as very rare.

30. Macropteryx mystacea (Less.).

Macropteryx mystacea, Salvad. *op. cit.* vol. i. p. 537.

a. ♂. Batchian.

Iris brown; bill and feet black. Length 32·5 centims., wing 22·2, tail 19·0. Shot October 9th.

31. Hirundo gutturalis, Scop.

Hirundo gutturalis, Salvad. *op. cit.* vol. ii. p. 1.

a. ♂. Batchian, October 10th.

32. Monarcha inornatus (Garn.).

Monarcha inornatus, Salvad. *op. cit.* vol. ii. p. 14.

a. ♂. Ternate.

Iris brown; bill light horny slate, lighter at edges and tip; feet dark slate. Length 17·4 centims., wing 8·5.

33. Monarcha chalybeocephalus (Garn.).

Monarcha chalybeocephalus, Salvad. *op. cit.* vol. ii. p. 30.
Piezorhynchus alecto, Cat. B. vol. iv. p. 415.

a, b. ♂. Ternate.
c. ♂. Batchian.
d, e. ♀. Ternate.
f. ♂ (?). Ternate.

Iris brown; bill and feet black. Length 17·1–17·5 centims., wing 8·5–8·8. I am not aware if the young male has the same plumage as the female, but example *f*, which is marked ♂, and is evidently immature, only differs from the females in having the metallic colour of the head passing on to the interscapulars.

34. Sauloprocta melaleuca (Q. et G.).

Sauloprocta melaleuca, Salvad. *op. cit.* vol. ii. p. 48.
Rhipidura tricolor, Cat. B. vol. iv. p. 339.

a. ♂. Ternate.
b. ♀. Batchian.
c. Batchian?

Iris brown; bill and legs black. Length of Ternate ♂, 24·3 centims.; of Batchian ♀, 21·5; wing 10·3–10·8.

35. Rhipidura obiensis, Salvad.

Rhipidura obiensis, Salvad. *op. cit.* vol. ii. p. 59.

a. ♂. Bisa I., Obi group.
b. ♂. Obi Major.

Iris brown; bill and legs black. Length 18 centims., wing 8·8–9·0, tail 8·8–9·2.

Salvadori, who describes only from the single type of the species, gives "*rectricibus duabus* (?) *extimis ad apicem late albis.*" The external pair alone are tipped with white, and the outer web of the feather is of that colour in its apical half.

This species is easily distinguishable by the broad white edging of the tertiaries.

36. Graucalus magnirostris, Forsten.

Graucalus magnirostris, Salvad. *op. cit.* vol. ii. p. 129.

a. ♂. Batchian.

Iris dark brown; bill and feet black. Length 34·3 centims., wing 17·5. The limit of the black of the head is not abruptly defined, but shades off gradually both above and below into the grey of the back and breast.

37. Campephaga obiensis (Salvad.).

Edoliisoma obiense, Salvad. *op. cit.* vol. ii. p. 151.

a. ♂ *juv.*? Bisa I., Obi group.

Iris brown; bill blackish brown; feet greenish black. Length 22·8 centims., wing 11·2, tail 10·0, tarsus 2·1, bill from gape 3·0.

Smaller in all its measurements than *C. melas*.

38. Lalage aurea (Temm.).

Lalage aurea, Salvad. *op. cit.* vol. ii. p. 163.

a–c. ♂. Ternate.
d. ♀. Ternate.

Iris brown; bill and feet black. Length 18·5–18·8 centims., wing 9·8. Abundant in Ternate.

39. Dicruropsis atrocærulea (G. R. Gr.).

Dicruropsis atrocærulea, Salvad. *op. cit.* vol. ii. p. 176.

a–f. ♂. Batchian.
g. ♀. Penambuan, Batchian.

Iris crimson or orange-red; bill and feet black. Length 34·0–

35·0 centims., wing 16·8–17·4, tail 16·0–17·0, bill from gape 3·6–3·9.

This species is most abundant in Batchian, but does not seem ever to have been recorded from Ternate.

40. Dicruropsis, sp.?

a. ♀. Bisa I, Obi group.

Iris brown; bill and feet black. Length 31·8 centims., wing 16·0, tail 14·5, bill from gape 3·5.

I am unable to refer this bird with certainty to any species, but am unwilling to add yet another species to the already somewhat overburdened genus on the strength of a single example. It is quite distinct from *D. atrocærulea*, not only in the broader pectoral spots but in its small size, and more especially in the possession of metallic hackles at the sides of the neck. The only species of this genus as yet recorded from the Obi group is *D. pectoralis* of Wallace. In the latter, however, the pectoral spots are very much larger and more conspicuous, and are greener in shade, while the neck-hackles are also longer and larger. The head of the Obi bird is without silky filaments, but this is the case in many examples of *D. pectoralis.* It is worthy of remark that the iris was noted by myself as brown.

41. Colluricincla megarhyncha (Q. et G.).

Colluricincla megarhyncha, Salvad. *op. cit.* vol. ii. p. 211.

a. ♀. Batchian.

This bird occurs in Mr. Kettlewell's collection. As, however, neither this genus nor *Rhectes* has been recorded from the Moluccas, some doubt must exist as to the accuracy of the locality. It does not differ in any way from specimens obtained from the island of Batanta.

42. Pachycephala mentalis, Wall.

Pachycephala mentalis, Salvad. *op. cit.* vol. ii. p. 216.

a. ♂. Ternate.

b. ♀. Batchian.

Iris brown; bill black; feet brown.

43. Pachycephala obiensis, Salvad.

Pachycephala obiensis, Salvad. *op. cit.* vol. ii. p. 219.

a. ♂. Bisa Island, Obi group.

b. ♀. Obi Major.

Iris brown; bill black; feet in male pinkish grey, in female light brown. Length 19·0 centims.; wing 9·2–9·5.

The female differs from that of *P. mentalis* in being smaller and having the throat light fulvous-brown, not greyish white. In *P. mentalis* the upper breast is brownish and the lower breast and abdomen dull olive-yellow, while in the present species the whole breast and abdomen are dull orange-yellow.

44. Cinnyris auriceps (G. R. Gr.).

Hermotimia auriceps, Salvad. *op. cit.* vol. ii. p. 260.

a–d. ♂. Ternate.
e. ♂. Batchian.
f, g. ♂. Bisa Island, Obi group.

The birds from Bisa Island are characterized by the bright copper-coloured bronze reflections on the head.

45. Cinnyris frenatus (S. Müll.).

Cyrtostomus frenatus, Salvad. *op. cit.* vol. ii. p. 265.

a. ♂. Ternate.
b, c. ♂. Batchian.
d. ♀. Batchian.

Iris dark brown; bill and feet black.

46. Melitograis gilolensis (Temm.).

Melitograis gilolensis, Salvad. *op. cit.* vol. ii. p. 349.

a, b. ♂. Batchian.
c, d. ♀. Batchian.

Iris brownish red; bill and feet black. Length 22·5 centims.; wing 10·2–11·2.

Feeds on flowering trees in cultivated clearings in the forest.

47. Criniger chloris, Finsch.

Criniger chloris, Salvad. *op. cit.* vol. ii. p. 376.

a–e. ♂. Batchian.
f–h. ♀. Batchian.

Iris red brown; bill bluish green, edges lighter; feet slate-colour. Length 21·0 centims.; wing 9·4–10·3.

48. Pitta maxima, Forsten.

Pitta maxima, Salvad. *op. cit.* vol. ii. p. 378.

a, b. ♂. Halmaheira.
c. ♀. Dodinga Bay, Halmaheira.

Obtained from Mr. Bruijn of Ternate.

49. Pitta rufiventris (Heine).

Pitta rufiventris, Salvad. *op. cit.* vol. ii. p. 401.

a. ♀. Batchian.

Iris bluish; bill black; feet olive. The bill is more slender in this species than in the other Erythropittas; there is no black throat, and very little trace of a dark line below the blue of the breast. The arrangement of the white spot on the wing in the present individual is the same as in some examples of *P. mackloti*; the inner web of the third primary, both webs of the fourth, and the outer web of the fifth only are white.

50. Anthus gustavi, Swinhoe.

Corydalla gustavi, Salvad. *op. cit.* vol. ii. p. 432.

a. ♀. Batchian, October 10th.

51. Erythrura trichroa (Kittl.).

Erythrura trichroa, Salvad. *op. cit.* vol. ii. p. 442.

a, b. ♂. Ternate.

Bill black; tarsus clear brown. This species, according to Wallace, is found in Ternate at a height of 2000 feet. It does not apparently confine itself to the mountains, as the present examples were obtained at a considerably lower altitude.

52. Calornis metallica (Temm.).

Calornis metallica, Salvad. *op. cit.* vol. ii. p. 447.

a. ♂. Ternate.

Iris red; bill and feet black.

53. Calornis obscura (Forsten).

Calornis obscura, Salvad. *op. cit.* vol. ii. p. 454.

a–d. ♂. Batchian.

e–g. ♀. Batchian.

h. Batchian.

Iris orange-red; bill and tarsus black. The iris in the females and in one of the males is noted as brown. Length 23·5–24·0 centims.; wing 9·5–10·3.

This species was found to be very numerous in Batchian.

54. Corvus validissimus, Schleg.

Corvus validissimus, Salvad. *op. cit.* vol. ii. p. 487.

a. ♂. Batchian.

Iris very dark brown; bill and feet black. Wing 34·0 centims.; culmen 8·0.

55. Lycocorax obiensis, Bernst.

Lycocorax obiensis, Salvad. *op. cit.* vol. ii. p. 495.

a, b. ♂. Obi Major.

c–e. ♀. Obi Major.

Head and upper surface obscurely shining greenish black; entire under surface the same but somewhat duller, especially on the abdomen. Tail black above, brownish black beneath, with obsolete bars. Inner remiges very dark brown; primaries buffish brown; shafts of feathers brown above, white beneath; inner web of some of the primaries white at the base. Iris crimson; bill, legs, and feet black. Length 44 centims., wing 19·8–21, tail 15·5–17, culmen 5·2–5·5, tarsus 4·4–4·7.

Salvadori relies on the absence of white on the inner webs of the primaries as a point of diagnosis from *L. morotensis*, which is not borne out by the present series, in all of which, with one exception, it is present. This bird, a female, is much less bright than the others; the wings are a lighter brown, and the primaries buff. The iris in this example was brown, not crimson.

56. Semioptera wallacei (G. R. Gr.).

Semioptera wallacei, Salvad. *op. cit.* vol. ii. p. 572.

a–i. ♂. Batchian.
k. ♂ *vix ad.* Batchian.
l–o. ♂ *juv.* Batchian.
p, q. ♀. Batchian.

Iris brown; bill horn-colour; tarsus yellowish orange. Length 29·7–30 centims., wing 15·2–15·8 (♀ 14·9–15·4), bill from gape 4·2–4·4.

The young males in the first stage of plumage appear not to differ in any way from the females. The assumption of the adult dress appears to take place by a gradual change in the colouring of the feather, not by moult. Thus, in one individual there is a small patch of green on the lower part of the neck, the subalar tufts forming the points of the metallic shield have just appeared, and two or three feathers on either side of the breast are shaded with metallic green. The standards are fully formed, but the nasal tufts are tinged with rufous. The appearance of the alar standards seems to be an early step in the progress towards full plumage. In example *h* the whole of the sides of the neck and breast is a mass of bare feather-cases, from which are springing the bright green pectoral tufts; the front of the breast has finished moulting. The standards, though nearly of full length, are still encased in their sheaths at the base; they are very broad (1·4 centim.) and greyish, not ruddy white as in the other birds. The nasal tufts have no shade of rufous. This is undoubtedly an old bird, and it may therefore be assumed that the ruddy tinge of the nasal plumes in some individuals is a sign of immaturity.

From the number of specimens that our hunters brought us, it is evident that this species must be tolerably abundant in the neighbourhood of the village of Batchian, although I never had the good fortune to see it alive. The natives told us that it was very local, frequenting certain parts of the forest only. This is certainly the case with some others of the Paradiseidæ. I cannot help thinking that a further exploration of the large uninhabited island of Obi would add either this or some closely allied species to its avifauna. Its geological characteristics appear to be the same as those of Batchian. There are no volcanic rocks, but conglomerate and sandstone abound, and coal is said to exist, though a visit we made, in company with the Resident of Ternate, in search of it was unsuccessful.

57. Ptilopus superbus (Temm.).

Ptilopus superbus, Salvad. *op. cit.* vol. iii. p. 6.

a–c. ♂. Ternate.
d, e. ♀. Ternate.

Iris yellow; bill slate, yellow at tip; feet red. Length 23·3 centims., wing 12·6–13·1.

58. Ptilopus prasinorrhous, G. R. Gr.

Ptilopus prasinorrhous, Salvad. *op. cit.* vol. iii. p. 41.

a. ♂. Weeda Islands, S.E. Halmaheira.

Iris orange; bill chrome-yellow; feet dull red. This is the most western point from which this species has hitherto been recorded.

59. Ptilopus monachus (Reinw.).

Ptilopus monachus, Salvad. *op. cit.* vol. iii. p. 20.

a, b. ♂. Sidangoli, Halmaheira.

Iris orange; bill slate; feet red. Length 18·5 centims., wing 10.

60. Ptilopus ionogaster (Reinw.).

Ptilopus ionogaster, Salvad. *op. cit.* vol. iii. p. 54.

a. ♀. Sidangoli, Halmaheira.

Iris yellow; bill slate; tarsus dull red. Length 24 centims., wing 12·4.

61. Carpophaga myristicivora (Scop.).

Carpophaga myristicivora, Salvad. *op. cit.* vol. iii. p. 74.

a–k. ♂. Weeda Islands, S.E. Halmaheira.

l–o. ♀. Weeda Islands.

p–r. Weeda Islands.

Iris dull crimson; bill black; feet coral red. Length from 45–48 centims., wing 23·4–25·5.

These Pigeons were very numerous on the Weeda Islands, but we found them so nowhere else. Shot in the middle of November, the cere was in no case large, and in this, as well as in other respects, there seemed to be no difference between the sexes.

62. Carpophaga basilica, Sund.

Carpophaga basilica, Salvad. *op. cit.* vol. iii. p. 96.

a, b. Batchian.

Iris reddish; bill black; feet coral-red. Length 42 centims.

The actual apex of the tail in these two examples is not grey, but dusky shaded with green. The upper surface, when the bird is held away from the light, is metallic copper-red, not "golden green with bronze reflections" as in Salvadori's description.

63. Myristicivora bicolor (Scop.).

Myristicivora bicolor, Salvad. *op. cit.* vol. iii. p. 107.

a. ♂. Sidangoli, Halmaheira.

b, c. ♂. Weeda Islands, S.E. Halmaheira.

d–f. ♀. Weeda Islands.

Iris very dark brown; bill greenish horn, yellow at tip; feet bluish black. The Gilolo bird is marked with black on the tibials; it is characterized by having some of the secondaries pure white, and by the wings and tail being greyish black rather than black. With regard to the Weeda Islands examples, it is noticeable that the amount of terminal black in the external pair of rectrices differs according to the individual. The total length varied from 39–41 centims., wing 22·5–23·5; but one extraordinarily small female from the Weeda Islands only measured 32·8 centims., wing 21·7. It was, however, apparently adult.

64. REINWARDTŒNAS REINWARDTII (Temm.).

Reinwardtœnas reinwardtii, Salvad. *op. cit.* vol. iii. p. 125.

a, b. ♂. Batchian.

c. ♂. Obi Latu.

Iris, inner ring yellow, outer red; circumocular bare skin red; bill red at base, tip brown; tarsus coral-red.

65. MACROPYGIA BATCHIANENSIS, Wall.

Macropygia batchianensis, Salvad. *op. cit.* vol. iii. p. 136.

a, b. ♂. Ternate.

c. ♀. Ternate.

In *a* the forehead is fulvous, passing into pinkish ash-colour on the vertex, and thence into the bright metallic colour of the cervix. The whole of the breast is vinaceous pink, each feather crossed by a narrow, well-marked, subapical blue-black bar. Example *b* differs in having nearly the whole head fulvous; there is less of the metallic colouring on the cervix, and the barring on the breast is very slight. The general colour of the female is light ruddy chestnut; the forehead strongly marked with black. The cervix and scapulars are barred with pale rufous and black, forming a patch at the back of the neck.

66. CALŒNAS NICOBARICA (Linn.).

Calœnas nicobarica, Salvad. *op. cit.* vol. iii. p. 209.

a. ♀. Bisa Island, Obi group.

Iris greyish pink; bill black; tarsus dark coral-red; soles of feet yellowish. Length 37·5 centims., wing 25·5.

With bright copper-coloured reflections on the upper surface; the forehead fuscous, well defined posteriorly.

67. MEGAPODIUS FREYCINETI, Q. et G.

Megapodius freycineti, Salvad. *op. cit.* vol. iii. p. 230.

a. ♂. Batchian.

68. TRINGA ALBESCENS, Temm.

Tringa albescens, Salvad. *op. cit.* vol. iii. p. 315.

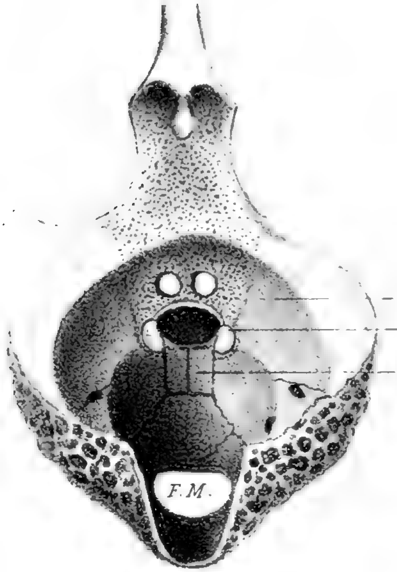
a–c. ♂. Weeda Islands, S.E. Halmaheira.

Iris brown; bill and feet black. Length 15·3 centims., wing 10–10·2. Shot October 16.

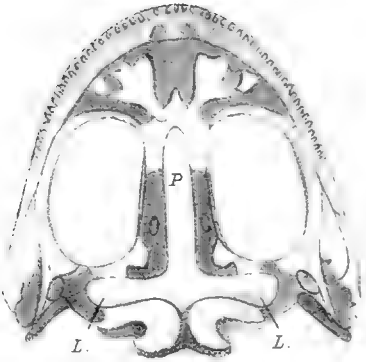
69. NUMENIUS UROPYGIALIS, Gould.

Numenius variegatus, Salvad. *op. cit.* vol. iii. p. 332.

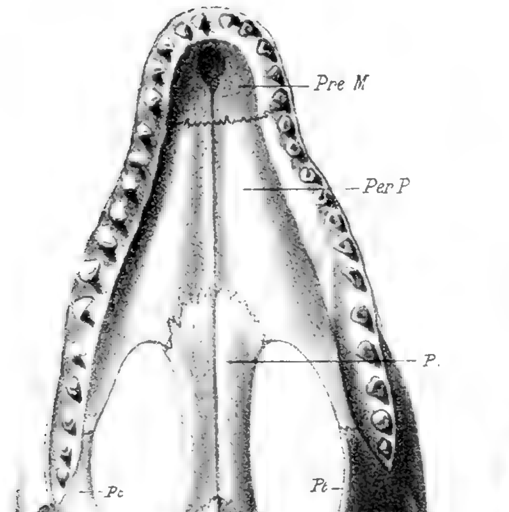
a. ♂. Obi Major, October 10.



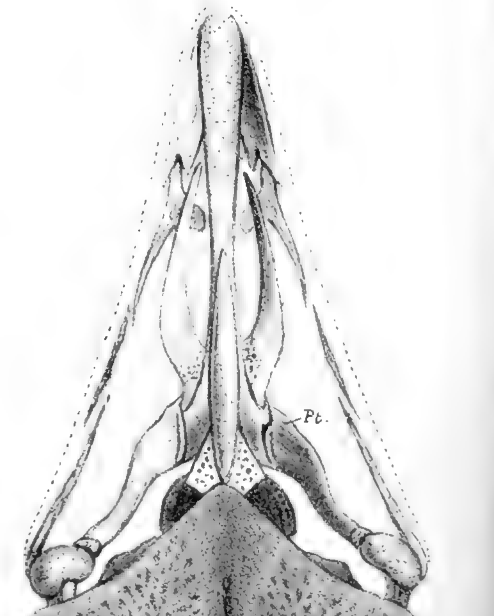
Ostrich. Fig. 3.



Frog. Fig. 2.



Crocodile. Fig. 4.



Chick. Fig. 1.

J. Smit lith.

SKULLS OF OSTRICH. FROG. CROCODILE & CHICK.

Hanhart imp.

3. On the Development and Morphology of the Human Sphenoid Bone. By J. Bland Sutton, F.R.C.S., Lecturer on Comparative Anatomy at the Middlesex Hospital Medical School.

[Received May 25, 1885.]

(Plate XXXV.)

It has been truly remarked that the mode of ossification of the sphenoid bone is one of the most difficult questions in osteogenesis. We may go further and say that the morphological relations of the precursors of the sphenoid bone, the trabeculæ cranii, present even greater difficulties. For some years past I have been, with the kind assistance of my pupils, gradually accumulating material for a thorough investigation of this interesting and important region of the skull. The result of the inquiry I propose to embody in this paper.

In order that the various constituent nuclei of the complex human sphenoid bone may be correctly comprehended, it is essential that the early stages of the human chondro-cranium be briefly sketched.

The embryological history of the cranial skeleton clearly shows that a uniform plan of construction underlies the skull in all Craniata; and that it may be divided into a basi-cranial region, formed by two cartilaginous plates enclosing the notochord, known as the parachordals, which later on fuse and form a continuous platform known as the basilar plate. The anterior limit is marked off by the pituitary body. This basilar plate or notochordal region of the skull-base forms a floor for the hind and mid brain. The second portion is composed of a pair of bars, the trabeculæ, embracing posteriorly the termination of the notochord, then separating to enclose a space, which is afterwards occupied by the pituitary body, they again come into contact, in most cases coalesce, and extend forward into the nasal region. This section of the primordial skull may be conveniently termed the basi-facial region, the trabeculæ forming a support for the fore brain (see fig. 1, p. 578).

The third element in the skull consists of the sense-capsules, auditory and olfactory; the optic capsules as a rule remain distinct.

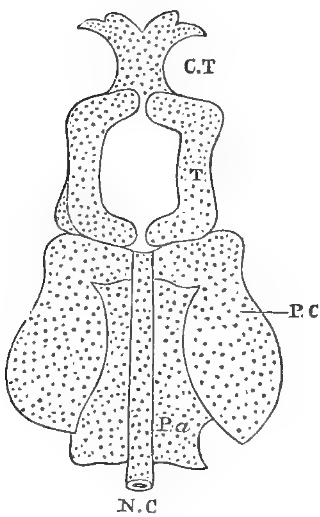
Lastly, the appendicular elements claim consideration; they comprise the palato-pterygoid, meckelian, and hyoid cartilages, and the remaining branchial bars.

The portion which more immediately concerns us in this paper is the trabecular region.

It is now admitted unreservedly by those anatomists who have dealt with the morphology of the skull from the vantage point afforded by embryology, that the basi-cranial region—the portion extending from the margin of the foramen magnum to the summit of the dorsum sellæ—is composed of the same elements as the vertebral column, but differs from it in that it has not passed through any stage of vertebration[1], the notochordal portion with the parachordals representing the centrum, with the laminæ which meet dorsally in man and mammals, over the developing brain in the occipital segment only.

Anteriorly the representatives of the laminæ take on a very different disposition. During development the skull, whose long axis was originally a direct continuation of, and in the same plane as, the vertebral column, becomes at an early period bent, or, as it is usually described, flexed downwards. One of the important results of this flexion is the dissociation of the anterior portion of the lateral

Fig. 1.



A diagram to represent the disposition of parts in the base of the primitive skull. *N.C*, Notochord; *Pa*, parachordals; *P.C*, periotic capsules; *T*, trabeculæ; *C.T*, ethmo-vomerine region.

neural walls from the parts immediately adjacent. Eventually these dismembered portions of the neural walls coalesce around the down-bent brain and are recognized as the trabeculæ cranii. This admirable explanation was first promulgated by Goette (Entwicklunggeschichte der Unke, page 629); and this view has certainly much more to recommend it than the notion that the trabeculæ are to be regarded as a pair of branchial arches.

[1] *Vide* Huxley, "The Cranio-facial Apparatus of *Petromyzon*," Journal Anatomy and Physiology, vol. x. p. 418.

After the trabeculæ have coalesced, growth occurs in them in three directions:—

1. Laterally, to form the side walls of the skull anterior to the periotic capsules.

2. Mesially, to fill up the floor of the pituitary fossa.

3. Forwards, to form the ethmo-vomerine and fronto-nasal plates.

Although the trabeculæ at a very early period form a floor to the pituitary fossa, yet this fossa is never completely shut off from the pharynx in the chondro-cranium; a small opening persists for a very long time, the consideration of which leads to some very interesting conclusions, and which renders necessary the study of the early stages of the formation of the mouth and pharynx. It has been very satisfactorily proved that the buccal mucous membrane is derived from the epiblast; the process by which this derivation occurs is usually described as a tucking-in of the epiblast; but in reality it is a necessary outcome of the primary cranial flexure. Passing between the open arms of the trabeculæ is a narrow tubular portion of the anterior primary encephalic vesicle, known as the infundibulum; this diverticulum from the primitive brain comes into contact with the buccal epiblast; the meeting point of the two structures is represented by the pituitary body. This disposition of the parts has long been known.

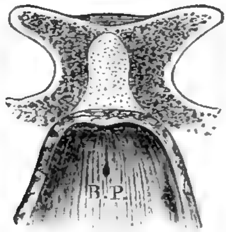
Whilst engaged working over the development of this complex region, I found that even at the mid period of intra-uterine life of the human embryo a narrow cavity may be detected passing from the pharynx through the basisphenoid, so as to come into close relation with the infundibulum.

The point of communication with the pharynx is in the middle line in contact with the basisphenoid, the spot being indicated at birth by a recess in the mucous membrane known as the bursa pharyngea (see fig. 2, p. 580). After birth the canal suffers obliteration; but a band of fibrous tissue, passing from the pituitary body to the pharynx, represents the original position of the canal. When the bone is macerated the fibrous tissue disappears, leaving a hole in the basisphenoid, termed by Landzert the canalis cranio-pharyngeus (Petersburger med. Zeitschrift, Bd. xiv.). This cranio-pharyngeal canal may be detected in the floor of the sella turcica in very many mammals at birth.

Up to the present time I have been unable to assure myself that the lower end of the infundibulum ever opens into the pharynx, but there is every probability that such is the case. However, the existence of this diverticulum of the first encephalic vesicle raises an exceedingly interesting question. It will be remembered that the central canal of the spinal cord at its caudal end is brought into relation in the early embryo of very many of the Vertebrata with the hind gut, by a narrow and, in most cases, very temporary passage known as the neurenteric canal, which passes around the caudal end of the notochord, but afterwards becomes obliterated.

Turning now to the cephalic end of the notochord, we find the central canal of the encephalic vesicles turning round the most anterior end of the notochord in the form of an infundibulum, to form a continuity with the buccal epiblast and come in very close relationship at first with the extreme end of the foregut; the place where these highly interesting occurrences take place being for a long time represented by the cranio-pharyngeal canal. The inquiry needed to make the demonstration complete is, to determine

Fig. 2.



The posterior wall of the pharynx, showing the position of the Bursa pharyngea, *B.P.* From a fœtus at the fifth month.

positively whether the infundibulum is always a cul-de-sac, or at some period communicates with the cavity of the future pharynx.

It is a very remarkable fact that the pituitary fossa and the space between the bladder and the rectum are common situations for those curious tumours known as teratomata; it will be interesting to ascertain the relation of the curious neurenteric passages to these morbid growths.

The ossification of the sphenoid must now be considered.

The alæ arise from single nuclei in the cartilage forming the lateral walls of the skull immediately anterior to the periotic cartilage, commencing about the eighth week of intra-uterine life. They are the first centres of this important bone to make an appearance.

A little later two circular spots may be detected *in* the cartilage forming the floor of the pituitary fossa. They first become visible on the under surface of the bone, and are not affected when the perichondrium is removed: these are the paired basisphenoidal nuclei.

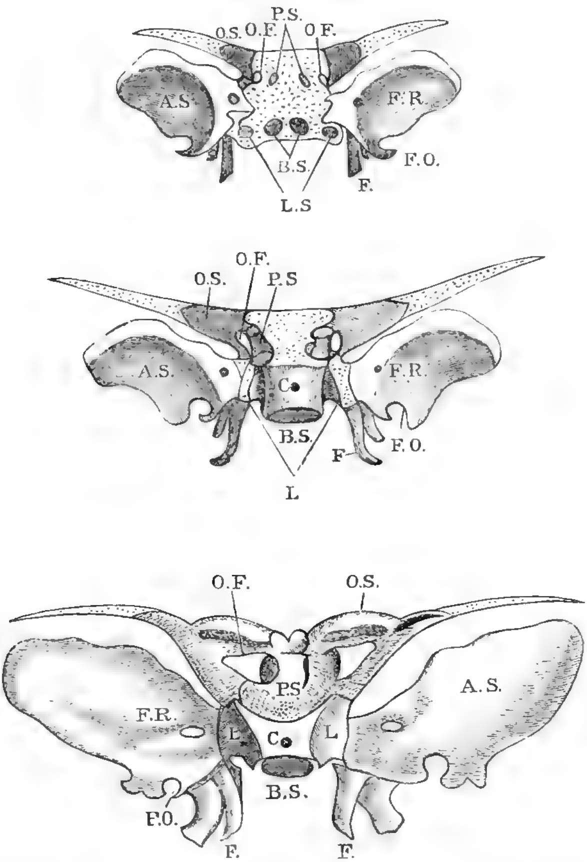
They are very quickly followed by two earthy spots in the lingulæ, lying between the alæ and basisphenoidal nuclei, as shown in fig. 3 A, which represents the disposition of these six nuclei, three on either side, viz. basi-, lingulæ-, and alisphenoid centres.

The two for the basisphenoid become quickly confluent from below upwards, and the lingulæ soon fuse with them and form a porous mass. The alæ grow rapidly, but remain separated from the lingulæ by a thin layer of cartilage until the first year after birth.

These six centres constitute with the internal pterygoid plate, which will be considered further on, the posterior portion of the sphenoid bone.

The details of the ossification of the presphenoid, or that portion in relation with the optic nerves, may be summarized as follows:—

Fig. 3.



A series of figures to show the disposition of the various nuclei of the human sphenoid bone.

The upper figure shows the relation of the centres to the cartilage; the latter in all cases is represented by dots.

In the middle figure the basisphenoidal nuclei have coalesced, the orbitosphenoids have joined the presphenoids, and the internal pterygoids have joined the alisphenoids.

In the lowest figure the sphenoid bone is represented as at the eighth month of fœtal life.

A.S, Alisphenoid; *B.S*, basisphenoid; *L*, lingulæ; *F*, pterygoids; *O.S*, orbitosphenoids; *P.S*, presphenoid; *O.F*, optic foramen; *F.R*, foramen rotundum; *F.O*, foramen ovale; *C*, cranio-pharyngeal canal.

The dorsum sellæ at this date is cartilaginous, and therefore it is not represented in the figures. The foramen ovale, until some time after birth, is only a *notch* in the alisphenoid.

Ossific matter is deposited immediately external to the optic foramen, and extends rapidly outwards to form the orbitosphenoid. This occurs about the commencement of the third month.

Later a nucleus makes its appearance on the inner side of each optic foramen, on the deep aspect of the perichondrium: these are the presphenoidal centres. They attain some considerable size before involving the cartilage, and can during the first month of their existence be removed without in any way disturbing the subjacent cartilage. The orbitosphenoid quickly sends down two spurs around the optic nerve, which fuse with the presphenoid. The presphenoids in their turn send a thin shell of bone across the dorsal aspect of the cartilage to fuse with each other; a small circular spot of cartilage long remains to indicate the point around which they united. It is long before these presphenoidal nuclei fuse below; a large piece of cartilage, belonging to the ethmo-vomerine plate, separates them, even for some months after birth. Long before this occurs the presphenoids, bearing their allies the orbito-sphenoids, have fused with the basisphenoids; the line of fusion being represented in afterlife by the ridge known as the olivary process.

Before dismissing the orbito-sphenoid, it is necessary to draw attention to one circumstance connected with it, of some interest. The lateral extension of the trabeculæ to form the side-wall of the chrondro-cranium is in the later stages replaced almost entirely by the alisphenoids.

If the region of the side-wall of the skull known as the anterior lateral fontanelle in the fœtus (in the adult it is called the pterion) be examined between the fourth and seventh months of intra-uterine life, it will be easily noted that the cartilaginous orbito-sphenoid extends into this fontanelle, so that for a considerable period it helps to form the side-wall of the skull. In man the permanent orbito-sphenoid never extends so far outwards as its cartilaginous forerunner, leaving the space to be filled in by the epipteric bone. The details of the ossification of this region I have considered elsewhere [1].

There remains little to add concerning the later development of the orbito-sphenoid, except to note that eventually the orbito-sphenoids of opposite sides send a thin lamella across that portion of the presphenoid which is anterior to the optic groove, thus excluding it from the cranial cavity.

The portions of the sphenoid previously considered are strictly cranial, but it receives an additional element from one of the appendages of the skull, viz. the palato-pterygoid bar.

In a paper published in the Proceedings of this Society for 1884, "On the Parasphenoid" &c., facts were adduced to show that the anterior portion of the palato-pterygoid cartilage in man became ossified to form the internal pterygoid plate; the nucleus for this bone may be detected as early as the commencement of the third month of intra-uterine life. The length of time it may remain as a separate ossicle varies within wide limits. I have seen it distinct from the sphenoid as late as the fifth month; but as a rule it will be found united with the under surface of the alisphenoid at the commencement of the fourth, so that it joins the alisphenoid before that bone

[1] "On the Relation of the Orbito-sphenoid to the Pterion," Journal of Anatomy and Physiology, vol. xviii. p. 219.

fuses with the corresponding lingula, with which element the internal pterygoid also has after birth an osseous union; the space left between this triple union of ala, lingula, and pterygoid being occupied by the vidian or great superficial petrosal nerve, a nervous cord of no small morphological significance, as I have previously shown. The external pterygoid plate is simply an apophysis from the under surface of the alisphenoid, becoming conspicuous about the third month of intra-uterine life. As a matter of convenience and ready reference, the dates of appearance of the individual centres and their fusion with one another are here given in a collected form.

At the eighth week the following centres appear quickly one after the other, in the following order:—

1. Alisphenoids.
2. Basisphenoids.
3. Lingulæ sphenoidales.
4. Internal pterygoids.

During the third month the ossific points fuse in the following order:—

1. Basisphenoidal nuclei coalesce, and the
2. Lingulæ join the basisphenoid.

At the third month the following centres appear:—

1. Orbito-sphenoid.
2. Presphenoids.

At the fourth month the orbito-sphenoids fuse with the presphenoids and the internal pterygoids join the alisphenoids. At the seventh month the presphenoid and postsphenoid coalesce. At the eighth month the presphenoids fuse together.

During the first year after birth the alisphenoids bearing the internal pterygoids coalesce with the lingulæ, and the so-called sphenoidal tubinals develop. The strip of cartilage which is prolonged from orbito-sphenoid to the anterior lateral fontanelle (the pterion) now disappears.

We must now deal with the morphology of the various centres of the sphenoid.

In the determination of the regions of the skulls in different types we are greatly assisted by the disposition of the cranial nerves, which in the majority of cases serve as fairly reliable guides.

The optic nerves always embrace the presphenoid, whilst the third division of the fifth cranial nerve usually quits the skull between the most anterior part of the periotic capsule and the alisphenoid, whilst the auditory nerve stands in very definite relationship with the various constituent nuclei of the periotic capsule, in those forms in which this cartilage undergoes ossification, so that as a rule we have no difficulty in distinguishing between the regions. When dealing with the individual ossific nuclei the case is very different, it being absolutely necessary to watch every stage of the development to avoid falling into the numerous pitfalls which abound on every side.

The presphenoid nuclei do not offer very much that is important, but the basisphenoid and its associated nuclei are in no small degree interesting.

Mr. Parker, in his very valuable paper, "On the Skull of the Common Fowl" (Phil. Trans. 1869), introduces us to two very remarkable bones which he names the basitemporals. I will describe them in Mr. Parker's own words:—"The subcranial region, which in the Frog is ossified by the basitemporal wings of the parasphenoid, is here supplied with a pair of distinct and large *basitemporal* bones which extend from near the median line, beneath the cochlea and so far outwards as to constitute a floor for the tympanic cavity; their anterior limit is near the fore margin of the alisphenoid cartilage. These ossifications arise in a thick weft of fibrous tissue in the hinder part of the palate; the matrix is abundant in the middle line, extending forwards to the bone next to be described. The Eustachian tubes run forwards and inwards above the anterior edge of these bones, and meet in the middle line beneath the pituitary fossa"[1]. The Fowl's basitemporals are shown on Plate XXXV. fig. 1.

It is needful to explain what is here meant by the basitemporal wings of the parasphenoid.

Underlying the Frog's skull (as shown in Plate XXXV. fig. 2) is a dagger-shaped bone termed by Prof. Huxley the parasphenoid, but it is simply the representative of the vomer of the mammalian skull: the lateral portions marked L in the figure are what Mr. Parker refers to as the basitemporal portions. The morphological value which the latter writer places upon the bird's basitemporal is so singular that it is needful again to quote his own description, contained in a footnote in the "Fowl" paper:—"From a careful comparison of these parts in the lower Mammalia with those of man, I feel satisfied that the bony lingulæ in that class answer to the basitemporal rudiments of the parasphenoid" (p. 770). This comparison was first suggested to Mr. Parker by Prof. Huxley, who states in a footnote in one of his admirable 'Lectures' that "Mr. Parker agrees with my suggestion that the basitemporals of the *Sauropsida* are the homologues of the *lingulæ sphenoidales* of Man" (p. 220).

My intention is now to proceed to show beyond all doubt that the "suggestion" and the "agreement" are out of harmony with the facts of the case and opposed to the usual methods of morphological reasoning.

The lingulæ of the Mammalian sphenoid have no relationship whatever with the basitemporals of birds.

The proof is as follows:—The basitemporals, and no one doubts the facts, arise in membrane. It is a well-established truth that a bone preformed in cartilage cannot be homologous with one simply of membranous origin. The basitemporals are membrane-bones; the lingulæ are preceded by cartilage. On this ground alone the evidence of identity fails. On Plate XXXV. fig. 3, is represented the base of the skull of a young Ostrich (*Struthio camelus*): two distinct osseous nuclei are seen lying on either side of the basisphenoid, between it and the alisphenoid; they are developed in cartilage, thus in mode of ossification as in their relations they correspond to the

[1] Morphology of the Skull, p. 231.

lingulæ of mammals. *In the same specimen the basitemporal bones are present.* The skull of this Ostrich is sufficient in itself to prove that the conclusions of Mr. Parker regarding the identity of the basitemporals of birds and the mammalian lingulæ sphenoidales are based on erroneous premises.

It now behoves me, seeing that I challenge these views, to identify the lingulæ, and explain the apparently anomalous condition of the basitemporals.

I shall address myself to the lingulæ first. In the skull of certain fish there is a centre known as the *sphenotic*, which occupies the antero-external region of the periotic capsule, but the cartilage in which it arises is always of a composite character, being due to the confluence of proper cranial cartilage with that of the periotic cartilage. This centre is present in the Fowl in the very spot where the lingulæ ought to be represented.

In the chondro-cranium of Man, the cochlear region of the periotic capsule comes into union with the lingulæ of the sphenoid, and the remains of the uniting cartilage are familiar to students of human anatomy as the cartilage filling up the foramen lacerum medium. If the cartilaginous lingulæ of the bird and man are homologous, and on that score there can be no doubt, then the ossific nuclei which transform them into bone should certainly be considered homologous also. On these grounds my contention is, that the nuclei called sphenotic in the Fowl and Ostrich are the true morphological representatives of the human lingulæ. It is now necessary to find out to what ossifications in the mammalian skull the basitemporals of the bird really correspond.

Turn from the Bird for a brief space, and inspect the hard palate of a Crocodile. From before backwards we find the following bones:—premaxilla, prepalatine portion of the maxilla, palate, and a bone usually marked pterygoid; passing from the outer edge of this bone to the maxilla is a bony bar known to anatomists as the os transversum, the general relations of which can be readily seen by reference to Plate XXXV. fig. 4.

The anatomical relations of the bone marked pterygoid are important in the following particulars: they surround the posterior nares, it being due to their intervention that the nasal passages are prolonged posteriorly to such a marked extent in the Crocodile. Above, they have the Eustachian passages, and externally they support the os transversum. This latter bone ought to be really regarded as the pterygoid. In Man's skull, and it is most probably true of other mammals, the internal pterygoid arises as an ossification of the distal end of the palato-pterygoid cartilage. The bone in the Crocodile's hard palate marked pterygoid arises as a membrane-bone, and during its growth the outer end invades to a slight extent the middle portion of the palato-pterygoid cartilage, and thus cuts off the distal end of the chondral rod, which becomes the os transversum, really the internal pterygoid.

Even at the risk of being tedious I must make myself clear on this point. In Man a rod of hyaline cartilage stretches from, and is continuous with, the malleus at the eighth week of intra-uterine life; it passes towards the anterior limit of the fronto-nasal plate. Later the rod becomes segmented as follows:—the distal end becomes internal pterygoid plate, the middle portion persists as the cartilaginous piece of the Eustachian tube, and the proximal portion degenerates into ligament. The details of the metamorphosis of this bar will be found in my paper on the "Parasphenoids" &c. (Proc. Zool. Soc. November 1884).

In the Crocodile the corresponding bar of cartilage is continuous posteriorly with the huge quadrate, its middle portion is considerably infringed by the so-called pterygoids, whilst its distal end is continuous with the os transversum.

If the bones forming the posterior limit of the hard palate in Crocodiles are not to be regarded as pterygoids, to what do they correspond? *They are the homologues of the avian basitemporals.* As is the case with the so-called pterygoids of the Crocodile, the bird's basitemporals are preformed in membrane, they underlie the basisphenoid, and the Eustachian tubes lie above them; but the bird in its aerial mode of life needs not a long tubular nasal passage, indeed its hard palate may be considered defective, and each basitemporal, instead of sending a process of bone to curve around the posterior nares, merely persist as a flat plate of bone which eventually becomes welded to the skull-base.

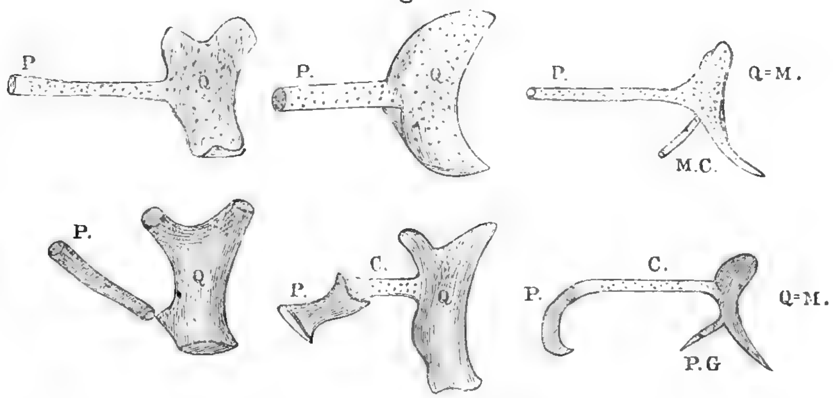
In birds the pterygoids take a different direction from that of the Crocodile's os transversum: in the former case they converge anteriorly, and in some avian skulls actually come into contact at the spot where they join the palatines, whilst posteriorly they abut upon the quadrate bone; this last fact is sufficient to prevent any misinterpretation as to their nature. In the Crocodile the anterior ends of the pterygoids are carried outwards, until they rest on the maxillæ, and the postpalatine bones (the so-called pterygoids), being wedged in between them, separate the pterygoids from the quadrate to such an extent as to disguise their real nature and make them appear as additional ossifications.

According to this view the pterygoid of Birds, the os transversum of Crocodiles, the transpalatine of the Snake, and the internal pterygoid of Mammals, including Man, arise in connection with the distal end of the palato-quadrate cartilage, and must therefore be regarded as homologous bones.

The so-called pterygoids of Snakes and of Crocodiles and the basitemporals of Birds agree in their mode of development and relationship to the main morphological landmarks of the skull; they must therefore be regarded as homologous ossifications, and as a matter of convenience it is proposed to name them *postpalatines*. Whether these ossifications are represented in the mammalian skull by the so-called sphenoidal tubinals, or by certain accessory ossicles which are developed in connection with the hinder end of the vomer in some types (marsupials, hedgehog, &c.), or not represented at all, is a matter of very little importance. It would of course be very interesting to be able to determine whether the bones which prolong the hard palate in some of the Edentates, *Myrmecophaga* for example, arise in the same manner as the bird's basitemporals. My conviction, so far as I have been able to look into the question, is that they do, but until my material is more abundant the question, with me, remains *sub judice.*

Fig. 4 is an attempt to represent in a graphic manner the metamorphosis of the palato-pterygoid bar in a Bird, in a Crocodile, and in Man, so as to explain how it comes about that in a Bird the

Fig. 4.



A series of diagrams to illustrate the metamorphoses of the palato-pterygoid arch in Birds, Crocodiles, and in Man.

P=pterygoid; *C*=cartilage; *Q*=the quadrate. In Man the malleus is the equivalent of the quadrate, and is represented thus: *Q*=*M*. *M.C.*, Meckel's cartilage; *P.G.* processus gracilis.

The upper row of figures represent the cartilaginous bars, arranged in order from left to right—Bird, Crocodile, and Man. The lower row represent the adult condition.

true pterygoids rest on the quadrate, but in the Crocodile and in Man the true pterygoids are separated by a piece of cartilage.

Lastly, in a preceding paper I endeavoured to dispose of the blade of the famous parasphenoid. On the present occasion I try to show that the view which would regard these basitemporals (postpalatines) as the homologues of the lateral portions of the Frog's parasphenoid is against the weight of evidence. The investigation supports my view previously expressed, *that the parasphenoid of the amphibian skull is represented in the highest mammals by the vomer, and by that bone alone.*

EXPLANATION OF PLATE XXXV.

Fig. 1. View of the base of the skull of a Chick at end of second week. *P.P*, Postpalatine (basi-temporals of Parker).

2. Under view of the skull of a Frog, to show the general appearance and relation of the so-called parasphenoid, *P.* The lateral portions are marked *L.*

3. The sella turcica of a young Ostrich, *Struthio camelus*, to show the lingulæ, *L.* *A.S*, Alisphenoid; *B.S*, basisphenoid; *F.M*, foramen magnum.

4. The hard palate of a Crocodile, to show the so-called pterygoid bones. *P.P*, The author's postpalatines; *P.N*, posterior nares; *E*, opening of Eustachian tube.

(Figs. 1, 2, and 4 after Parker.)

4. On a Collection of Shells (chiefly Land and Freshwater) from the Solomon Islands. By Edgar A. Smith.

[Received May 26, 1885.]

(Plates XXXVI. & XXXVII.)

The specimens forming this collection were obtained by Mr. H. B. Guppy, Surgeon on board H.M.S. 'Lark,' which visited the Solomon Islands in 1882 for hydrographical purposes. Special value attaches to the collection, as in every instance the particular island where each individual specimen was collected has been noted by Mr. Guppy, to whom much praise is due for his great care in this respect, and also for the admirable manner in which the shells themselves have been preserved. A large number of Helicidæ have already been recorded from these islands, but in many instances the precise island has not been mentioned. It is important to know this, for as far as our present knowledge extends some species appear to be restricted to special islands, whilst others are known to exist on several. The series of *Melania* and *Neritina* are particularly interesting, as the freshwater forms from these islands have been comparatively overlooked. The genera *Ampullaria, Paludina, Limnæa, Physa, Planorbis,* and *Ancylus* are as yet unrecorded from this group, and the only member of the family Unionidæ which is known to exist there is that (*Unio guppyi*) described further on in this paper.

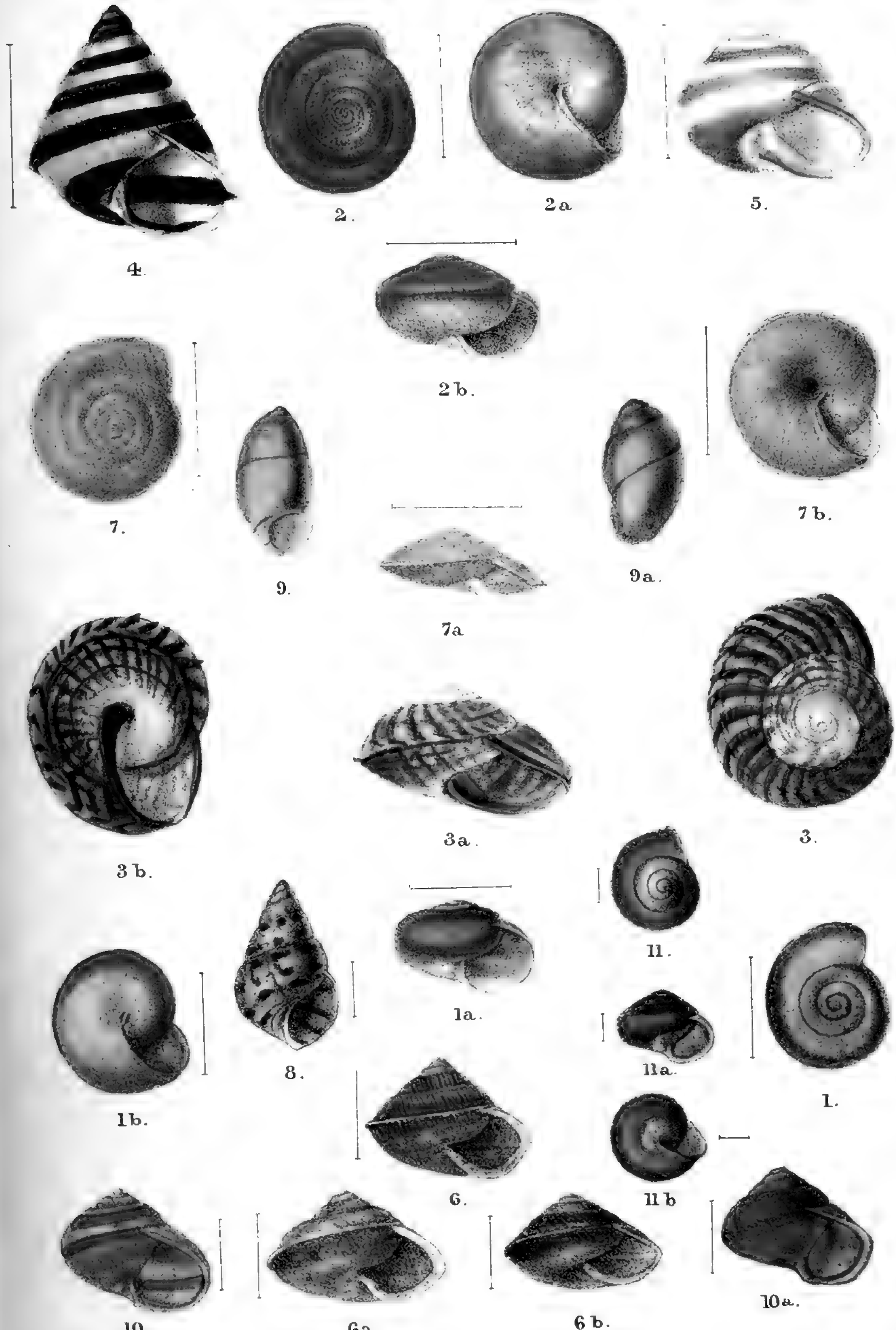
Of *Neritina* only six species have been noticed, namely:—1. *N. macgillivrayi*, Reeve; 2. *N. porcata*, Gould; 3. *N. dubia*, Chemnitz; 4. *N. christovalensis*, Reeve; 5. *N. adumbrata*, Reeve; and perhaps 6. *N. cuprina*, Récluz. Of these numbers 1, 2, 3, and 5 were also collected by Mr. Guppy, in addition to which he obtained eleven other species. These are:—7. *N. cornea*, Linné; 8. *N. subsulcata*, Sowerby; 9. *N. pulligera*, Linné; 10. *N. petiti*, Récluz; 11. *N. olivacea*, Le Guillou; 12. *N. asperulata*, Récluz; 13. *N. variegata*, Lesson; 14. *N. turtoni*, Récluz; 15. *N. brevispina*, Lamarck; 16. *N. squarrosa*, Récluz; 17. *N. sanguisuga*, Reeve.

Some of these species range not only through most of the islands of the Solomon group, but have a considerably wider distribution. This wide dispersal of these freshwater Nerites may be due to the fact that their egg-capsules are calcareous and apparently able to resist salt-water. These, if attached to floating timber, might be carried considerable distances. It is less likely that the perfect live shells would be transported in this way, for according to some experiments made by Mr. Guppy, it appears that they cannot stand submersion in salt-water for any length of time. One individual (*N. cornea*) survived after a submersion of 12 hours, but when a dozen were placed in the water and kept there five days not one survived, although the water was changed from time to time.

1. Helicarion planospira, Pfeiffer.

Hab. Ugi and Santa Anna (*Guppy*).

This, the only species of *Helicarion* as yet recorded from the



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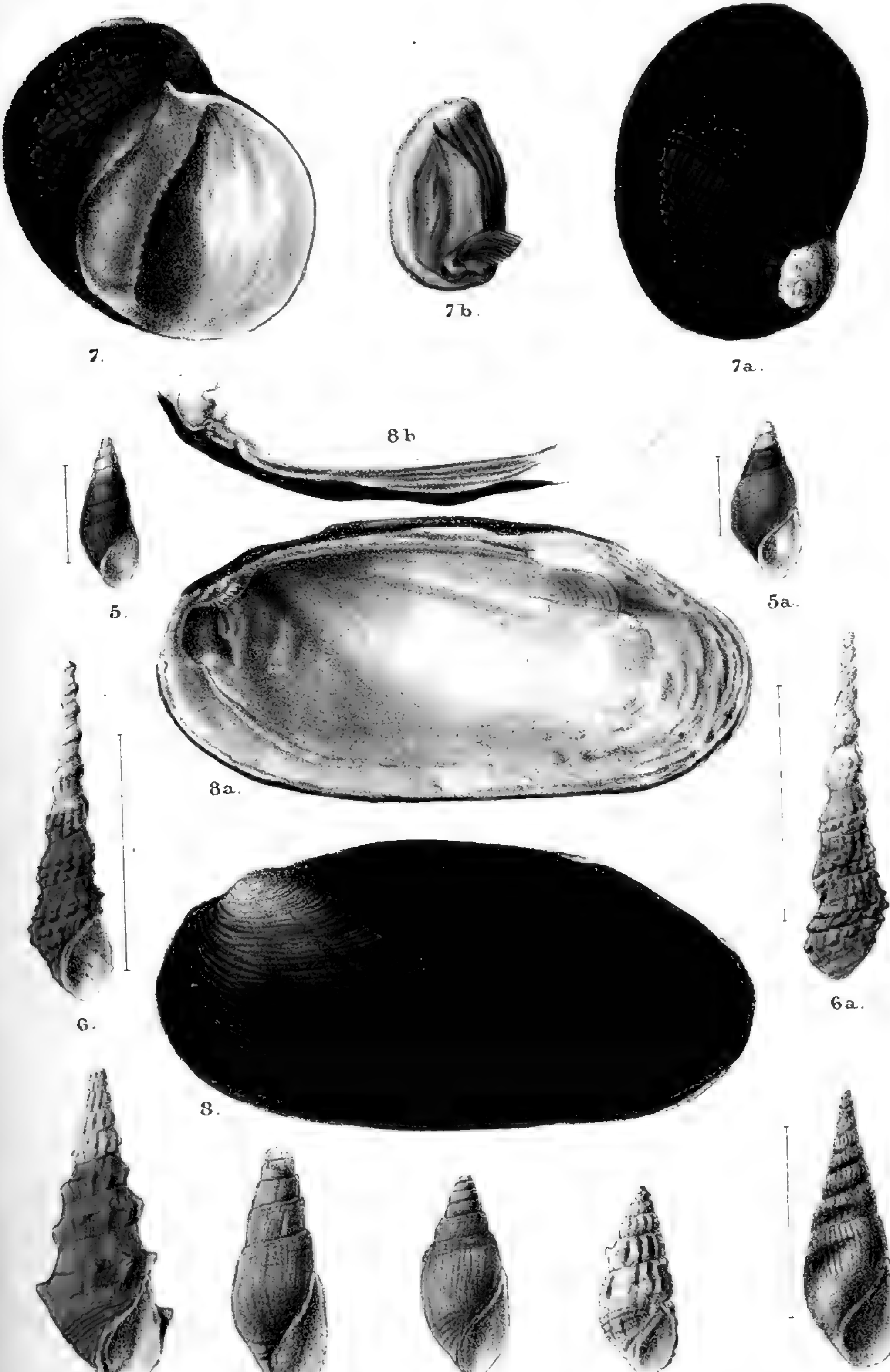
LAND SHELLS FROM THE SOLOMON ISLANDS.



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FRESHWATER SHELLS FROM THE SOLOMON ISLANDS

Solomon Islands, has also been collected further north than Ugi, on San Christoval and Guadalcanar, by Macgillivray.

2. Helix (Nanina) nitidissima. (Plate XXXVI. figs. 1, 1 *b*.)

Shell thin, transparent, very glossy, depressed, narrowly perforate, pale brownish horn-colour above, whitish towards the umbilicus, sculptured with very faint lines of growth. Whorls 4–5, slightly convex, impressed and marginate above at the suture; last whorl large, rounded at the periphery. Aperture obliquely lunate; peristome simple, thin, slightly thickened and reflexed partly over the perforation. Spire low, but very little raised above the last whorl, obtuse at the apex. Greatest diameter 14 millim., smallest 12; height 9.

Hab. Treasury Island, Bougainville Straits.

Nanina casca of Gould, from the Fiji Islands, is very like this species, but has more slowly increasing whorls: the last is proportionally smaller than in *H. (Nanina) nitidissima*.

Two specimens from Guadalcanar Island, collected by J. Macgillivray during the voyage of H.M.S. 'Herald,' and presented by him to the British Museum, may be considered as referable to a variety of this species, having the spire somewhat more elevated and the body-whorl a little more globose.

3. Helix (Nanina) solidiuscula. (Plate XXXVI. figs. 2, 2 *b*.)

Shell very narrowly perforate, depressed, somewhat solid, dark chestnut-brown and a little glossy above, more shining and paler beneath, becoming almost white at the umbilical region; whorls $6\frac{1}{2}$, convex, separated by a deepish suture, and, with the exception of two or three at the apex which are smooth, sculptured with strong, close-set, arcuate, and oblique striæ on the upper surface, crossed with a few more or less distinct spiral lines. Body-whorl rounded at the periphery, or sometimes with the faintest indication of an angle, convex, and only exhibiting fine lines of growth below. Aperture obliquely semi-lunate; peristome simple, but, owing to the solidity of the shell, seeming slightly thickened, especially on the very oblique columellar margin, which is shortly reflexed above over the perforation. Spire depressed-conoid, having the least convex outlines and an obtuse apex. Greatest diameter 18 millim., smallest $16\frac{1}{2}$, height 12; aperture 8 long, $4\frac{1}{2}$ wide.

Hab. Santa Anna Islands, "living generally on the trunks of cocoa-nut palms" (*Guppy*).

This species is well distinguished by its comparative solidity and strong sculpture on the upper surface.

4. Helix (Corasia) tricolor, Pfeiffer. (Plate XXXVI. figs. 3, 3 *b*.)

This species was described originally from specimens collected at the island of San Christoval; it was obtained at Ugi or Gulf

Island by Brenchley during the cruise of the 'Curaçoa,' and Mr. Guppy found it at San Christoval, Ugi, and Santa Anna, all of these localities being at the southern end of the group. As the species has not been recorded from any of the other islands, it is possible its distribution may be confined to San Christoval and the small islands in the immediate vicinity. The variety β of Pfeiffer (Monog. Helic. vol. iv. p. 193) was obtained by Mr. Guppy at Santa Anna; one of the specimens, which evidently is adult, being more conical above and only 25 millim. across at its greatest diameter, whilst the normal form from San Christoval attains at times an extreme width of 35 millim. Specimens of the typical form, of the same large size, but lacking the red markings on the sutural band and at the keeled periphery, were collected at San Christoval by J. Macgillivray, Esq., during the voyage of H.M.S. 'Herald.'

A specimen obtained on the north coast of the same island by Mr. Guppy is worthy of special mention, and may be termed var. *picta*, on account of the undulating reddish-brown stripes which ornament both the upper and lower surfaces.

A similar example was also collected by Dr. A. Corrie and presented to the Museum. The markings on these two shells are very striking and distinctly visible within the aperture.

5. Helix (Corasia) anadyomene, A. Adams & Angas.

Hab. Ugi I.

The single specimen obtained by Mr. Guppy is a rather more adult shell than the type, which was presented to the British Museum by Mr. Angas. It has somewhat more strongly marked lines of growth, is of a rather thicker substance, and has the peristome more thickened and more broadly reflexed. Guadalcanar Island, where this species was first discovered, is a little to the west or north-west of Ugi or Gulf Island.

6. Helix (Geotrochus) acmella, Pfeiffer.

Hab. Faro Island and Florida Island.

Of this species only one variety has previously been mentioned, which is of an almost uniform greenish-yellow tint. A specimen "from the coral-limestone region" of Florida Island has the body-whorl of a salmon-tint and the three topmost volutions bright red. The peristome is white, as in the normal form.

It seems to me doubtful whether this species is really specifically distinct from *H. meta*, Pfr.; for even in the small series in the Museum the gradual transition from one form to another can almost be demonstrated. The greater convexity of the whorls, the broader body-whorl, and consequently the sharper spire, mainly distinguish this species. It was originally said to have come from the Admiralty Islands, the inaccuracy of which locality has since been pointed out by Brazier (Journ. de Conch. 1880, p. 302), who obtained specimens from Bougainville and Ysabel Islands, showing that this species has a rather extended range in this group of islands.

7. Helix (Geotrochus) gamelia, Angas.

Hab. Shortland and Treasury Islands in the straits between Bougainville and Choiseul Islands (*Guppy*); Stephen and Ysabel Islands (*Angas*).

8. Helix (Geotrochus) hargreavesi, Angas.

Hab. Faro Island, also between Bougainville and Choiseul Islands. Found in the higher parts of the island up to the summit, 1900 feet above the sea.

This and the preceding species are very closely related, the colour and disposition of the bands being almost the same. *H. hargreavesi* may, however, be recognized by its more elevated conical form, the much broader band on the base of the body-whorl, the blackish-brown peristome, the dark-coloured callosity overspreading the umbilical region, and the peculiar oblique columellar margin, which is thickened and almost subtruncate anteriorly where it falls within the outer edge of the lip, which is fused above with the spreading umbilical callus. In *H. gamelia* the last whorl does not descend in front, whereas in the present species it takes a rather sudden and considerable turn downwards.

9. Helix (Geotrochus) mendana, Angas.

Hab. Shortland Island, Bougainville Straits.

In the Proc. Zool. Soc. 1867, p. 889, Angas gave Ysabel Island as the locality of this species, but he subsequently presented two specimens to the British Museum from Bougainville Island.

10. Helix (Geotrochus) motacilla, Pfeiffer.

Hab. Simbo Island, south of Choiseul Island.

Eddystone Island, where this species was originally discovered, also belongs to the Solomon, and not to the Admiralty group as stated by Pfeiffer. The specimens brought home by Mr. Guppy belong to the variety ornamented with four spiral bands upon the body-whorl, two above and two below the middle, of which the two nearest the somewhat carinate periphery appear to be invariably of a darker tint than the rest.

11. Helix (Geotrochus) guppyi. (Plate XXXVI. fig. 4.)

Shell elevately conical, thin, pale yellow, ornamented with conspicuous nearly black or black-brown spiral bands, one above and one below the sutures of the upper whorls, and three upon the last, one sutural, the second peripheral, and the third basal. Volutions 6, rather slowly enlarging, a little convex, sculptured with fine oblique striæ of growth, not glossy. Three first whorls livid purplish, the last rather sharply angled at the middle, not descending in front, having the basal band broad around the almost concealed perforation, and obsolete within the aperture. The latter is oblique, somewhat narrowed and pouting in front, banded within with three almost black and two white bands, the central one of the former being squarely truncate at the end, only the lower corner of it touching the margin of the lip, which is pale, oblique, receding, a little expanded and reflexed in front and at the columellar margin, the upper end of which is spread over and nearly conceals the small umbilicus. Height $22\frac{1}{2}$ millim., greatest diameter 19, smallest 16.

Hab. Faro Island, Bougainville Straits; "in the higher parts of the island up to the summit, 1900 feet above the sea."

This species is remarkable for the striking contrast of its colour-bands and the angular character of the last whorl.

12. HELIX (GEOTROCHUS) DAMPIERI, Angas, var. (Plate XXXVI. fig. 5.)

Shell imperforate, subglobose, conoid, light brown or fawn-colour, here and there minutely dotted with dark-grey specks, with a broad white band around the middle of the penultimate whorl and two upon the last, one above and the other below the middle, also a narrow white line revolving up the spire beneath the suture, and a dark brown zone surrounding the pale or yellowish umbilical region. Whorls 5, a little convex above, somewhat glossy, obliquely and very finely striated by the lines of growth, the last more or less concentrically striated beneath, shortly descending at the aperture, which is white within. Lip a little thickened, edged with reddish brown, only slightly expanded on the right side, more dilated below, produced into a thin transparent callosity over the umbilical region, united above to the upper extremity of the peristome. Columellar margin oblique, white or partly tinged with reddish brown, thickened and terminating below within the edge of the lip. Height 19 millim., greatest diam. 22, smallest 19.

Hab. Choiseul Bay, Bougainville Straits (*Guppy*); Louisiade Archipelago (*Angas*).

The specimens from the Solomon Islands are smaller than the type with which, through the kindness of Mr. G. F. Angas, I have compared them. They also have the peristome brown, and the basal band is darker.

13. HELIX (GEOTROCHUS) EROS, Angas.

Hab. Shortland Island, Bougainville Straits (*Guppy*).

This species also occurs at Ysabel and Stephen Islands according to Brazier and Angas, being very abundant on trees at Ysabel. It varies considerably in colour, and has not always a rose-tinted peristome, whilst the apex of the spire is in some specimens purple-brown instead of rose. The single shell obtained by Mr. Guppy is dark purple-brown, with a white zone at the suture, which is sparsely marked with dark dots. It has a white band at the periphery, and a broad zone of the same colour around the umbilicus; the lip is pink.

14. HELIX (GEOTROCHUS) CLERYI, Récluz. (Plate XXXVI. figs. 6, 6 *b*.)

This species, with which may be united *H. helicinoides* of Hombron and Jacquinot, is subject to considerable variation in size, colour, and form, apparently resulting from difference of habitat. The typical form occurs in San Christoval and Ugi, and also in Guadalcanar and New Georgia, but in a somewhat dwarfed condition. An entirely white variety with a pellucid zone on the upper surface, occupying the position of the brown band in the type, was collected by Macgillivray on San Christoval. Mr. Guppy obtained several forms of this species at Choiseul Bay, Shortland, Treasury, Simbo, Rua Sura, and Santa Anna Islands.

The specimens from the last locality (var. *meridionalis*, fig. 6 *b*) are smaller than the type, pale brown above, with a white thread-like line at the suture, and the acutely keeled periphery, paler beneath, especially towards the centre, and have the aperture particularly acuminate at the termination of the keel. These specimens, which were found by Mr. Guppy living "on young cocoa-nut palms growing on low ground bordering the sea," recall to mind *H. eva* from the New Hebrides, which, however, has a narrower body-whorl, usually a coloured lip, and is generally of a more solid texture.

The specimens from Simbo (var. *simboana*, fig. 6 *a*) are uniformly pale horn-colour, rather sharply carinate at the middle, and have the peristome white, considerably thickened and almost notched at the upper end of the columella, and the body-whorl is more contracted than in the typical form. The examples from Choiseul Bay, Shortland and Treasury Islands (var. *septentrionalis*, fig. 6) are all alike, of smaller dimensions than the normal form, thin, pale brownish horn-colour, with rather more convex whorls than usual, the carina at the periphery being acute and thread-like as in the variety *simboana*.

Whether these several varieties should take specific rank is questionable, for, although there is considerable difference between the extreme forms, even in the series of nearly one hundred specimens under examination, the gradual transition from one form to another is observable.

15. Helix (Videna) merziana, Pfeiffer.

Hab. Ugi Island.

Neither of the two specimens from this locality is typical, nor are they both alike. One is about the usual size, but less sharply carinate, of a paler colour above and variegated with less of the opaque streaks. The second specimen is more abnormal, especially in form, and rather like *P. meleagris*, Pfr., except that it is keeled. The two species already mentioned, also *H. deiopeia*, Angas, and *H. sebacea*, Pfr. (= *H. cerealis*, Cox, afterwards changed to *H. thorpeiana* by Brazier), are all very closely related, *H. sebacea* (stated by Pfeiffer to be from the Admiralty Islands) evidently being but a pale variety of *H. meleagris*.

The typical form inhabits San Christoval and New Georgia. *H. meleagris* and *H. deiopeia* are found at Guadalcanar, and the special locality of *H. sebacea* is unknown, "the Admiralty Islands" given by Pfeiffer probably being one of the many false habitats emanating from Cuming's collection. Having the actual types of both *H. sebacea* and *H. cerealis* under examination, I have no hesitation in pronouncing them identical.

16. Helix (Videna) sanctæ annæ. (Plate XXXVI. figs. 7, 7 *b*.)

Shell depressed-conoid, deeply umbilicated, very acutely keeled at the periphery, light brown, sometimes with a few radiating pale streaks on the upper surface, sculptured with oblique lines of growth. Whorls 5, rather slowly increasing, slightly convex, depressed and margined above the suture, last not descending, compressed above and below the keel, a little convex towards the umbilicus, which is moderately large. Aperture transverse, flesh-tinted within. Peristome simple, a little thickened along the basal margin, with the extremities united by a thin callus. Height 7 millim.; greatest diameter 17, smallest 15.

Hab. Santa Anna. "Living generally on the trunks of cocoa-nut palms" (*Guppy*).

This species is very like *H. latimarginata*, Smith, from the Fiji Islands and Contrariétés Island, Solomon group; but is a trifle larger, more widely umbilicated, has a less convex spire, and a broader body-whorl. The pale streaks on the upper surface are like those in *H. merziana*, Pfr., but they do not occur in all examples.

17. Helix (Rhytida) villandrei, Gassies.

Hab. Ugi Island (*Guppy*); San Christoval (*Macgillivray, Angas,* and *Brazier*).

18. Helix (Camæna) hombroni, Pfeiffer.

Hab. Shortland and Faro Islands (*Guppy*); Ysabel Island (*Brenchley in Brit. Mus.*); Solomon Islands (*Hombron and Jacquinot*).

"Admiralty Islands," the locality originally assigned to this species, is evidently incorrect.

19. Helix (Chloritis) eustoma, Pfeiffer.

Hab. Ugi and Faro Islands (*Guppy*); New Georgia (*Macgillivray*).

With this species should be united *H. erinaceus* of Pfeiffer, for having carefully compared the types of both forms, I do not find any difference, and therefore conclude that *H. eustoma* is another instance of a species wrongly assigned to the Admiralty Islands.

20. Bulimus (Placostylus) cleryi, Petit.

Hab. "The Koofeh district on the north coast of San Christoval" (*Guppy*).

This remarkable species varies considerably in form, some specimens being much constricted round the middle of the body-whorl and much more slender than others, which show no trace of irregularity of outline. The type figured by Petit has a length of 100 millim., and is 35 wide, the aperture being 60 in length. As an instance of extreme variation, I give the dimensions of one of the specimens collected by Mr. Guppy: length 104, breadth 29!; aperture only 50 long.

The sculpture of this species does not appear to have been hitherto properly described. In well-preserved specimens the first four whorls are sculptured very much like a fine thimble. A cessation in growth or some important change then takes place, which is marked on the shell by an oblique indentation, from which point the sculpture alters, consisting of coarsish lines of growth and irregular spiral striæ. The peristome varies in colour, being either white or almost golden, but generally of a reddish-flesh tint. The columella-twist is also variable, in some specimens being much thicker and more contorted than in others.

21. Bulimus (Placostylus) founaki, Hombron and Jacquinot.

Hab. Faro Island, Bougainville Straits.

This species has not been recorded from so northern a locality, and in fact has only been previously obtained at Ysabel Island. The name of this species has (perhaps rightly) been changed by M. Crosse to *B. hombroni.*

22. Bulimus (Placostylus) miltocheilus, Reeve.

Hab. Ugi or Gulf Island, the south-east part of San Christoval and Santa Anna.

The last island is a new locality for this species, the distribution of which has been given by Brazier in the 'Proceedings of the Zoological Society,' 1869, p. 162. He says that it varies much in size and colour. An interesting variety with a white lip was obtained by Mr. Guppy both at San Christoval and Santa Anna. Like *B. cleryi* this species has the upper whorls finely punctate, and suddenly alters the character of the sculpture after two and a half volutions have been formed. In adult shells this peculiar pitting on the apical whorls is generally more or less obliterated.

23. Partula, sp.

A small species of this genus was collected by Mr. Guppy in Treasury Island and at Choiseul Bay, which appears to be very like *P. cinerea,* Albers. The same species was also obtained at Gulf Island by Mr. Brenchley, and at Guadalcanar by J. Macgillivray, both of whom presented specimens to the British Museum. Albers describes the whorls of his species as "planiusculi," whereas in all the examples under examination they are rather convex, but with this slight exception they correspond very closely with his diagnosis.

24. Succinea simplex, Pfeiffer, var.

Hab. "From marshy districts where Taro is cultivated, Treasury and Shortland Islands" (*Guppy*).

These specimens are of a darker tint than those described by

Pfeiffer, have the spire a trifle shorter, and the body-whorl the least more ventricose. In all the apex is reddish, and the lines of growth rather coarse.

25. Cyclostoma (Adelostoma) triste, Tapparone Canefri, var.?

Hab. Faro and Shortland Islands and Choiseul Bay in Bougainville Straits and Santa Anna Island (*Guppy*); Guadalcanar (*Macgillivray*, in Brit. Mus.).

Dr. Tapparone Canefri has kindly compared specimens from these islands with his *C. triste*, and is of opinion that they may be considered a variety of it; and observes that the New-Guinean form is a little smaller, its spire a little more slender, its surface more glossy, the colour redder, and the apex of the spire darker.

The shells under examination are clothed with a very thin epidermis when in a fresh condition, exhibiting numerous very fine spiral thread-like lines, which entirely disappear in worn shells and can easily be rubbed off with a brush. For several species having a similar epidermis and an incomplete peristome, Dr. Tapparone Canefri has proposed the subgenus *Adelostoma*. The little shell *Cyclostoma infans* from Wild Island, Admiralty group, described from the 'Challenger' Collection (Proc. Zool. Soc. 1884, p. 226, pl. xxiii. fig. 8) belongs to the same section.

26. Leptopoma jacquinoti, Pfeiffer.

Hab. Rua Sura Island, off the north coast of Guadalcanar.

This species does not appear to have been frequently met with by collectors, and is chiefly known (as *Cyclostoma pellucida*) by Rousseau's description in the 'Voyage au Pôle Sud,' and the diagnosis by Pfeiffer taken from the figure in the Atlas to that work. The three specimens collected by Mr. Guppy are uniformly semipellucid white, with the exception of the apex, which is pale reddish. The whorls are five in number, considerably convex, rapidly enlarge, and are sculptured throughout with very fine concentric striæ besides the more prominent spiral liræ, which are most distinct upon the body-whorl above the prominent carina at the periphery. The peristome is moderately and equally expanded all round except at the short interruption at the body-whorl and just under the umbilicus, where it is conspicuously emarginate. The operculum is thin, pale dirty yellowish, consists of about eight volutions which are separated by a raised revolving sutural line and sculptured with rather coarse cross-lines of growth.

The largest of the three specimens from Rua Sura is 15 millims. high, 17 at its greatest diameter and $12\frac{1}{2}$ at its smallest.

L. immaculatum, Chemnitz, is very like this species in some respects, but differs a little in form, having a taller and more conical spire, less rounded whorls, a more shallow suture, &c.

27. Leptopoma vitreum, Lesson.

Hab. Santa Anna, Simbo, and Shortland Islands.

This species, originally described from New Guinea and subsequently met with at several other localities, has not, I believe, been previously recorded from the Solomon Islands. The only three specimens obtained by Mr. Guppy are entirely white,' and two of them have an indication of an angle or keel at the periphery, the other, from Santa Anna, being regularly rounded at the middle.

28. Omphalotropis nebulosa, Pease. (Plate XXXVI. fig. 8.)

Hab. Ugi Island, "found living on trees which clothe a low tract of land skirting the beach" (*Guppy*); San Christoval and Guadalcanar Islands (*Macgillivray*, in Brit. Mus.); Solomon Islands (*Pease*).

The shells which I associate with this species were considered by Pfeiffer the *O. bulimoides* of Hombron and Jacquinot. That species, however, was collected at Hogoleu, one of the Caroline Islands, situated about a thousand miles to the north-west of San Christoval, and does not appear to have a carinated umbilicus judging from the figure in the 'Voyage au Pôle Sud' and from Rousseau's description in the text. It also has much more convex whorls and a longer aperture.

The colouring of this species varies considerably. The majority of specimens which I have examined are dirty whitish or yellowish, varied with more or less interrupted spiral brown bands, of which there are four on the body-whorl, two above and two below the middle. Other examples are of a nearly uniform brown colour with a pale line at the periphery, and, again, others are longitudinally streaked. The operculum is thin, horny, concave externally, and consists of three to three and a half rapidly enlarging whorls, the nucleus being well towards the centre. *O. fragilis*, Pease, is very like this species, but has a slight keel or angle at the periphery, stronger spiral striæ, and a less effuse base to the aperture.

29. Pupina solomonensis. (Plate XXXVI. figs. 9, 9 *a*.)

Shell small and very like *P. difficilis*, Semper, and *P. keraudreni*, Vignard. It is of a reddish tint, especially the body-whorl; consists of $5\frac{1}{2}$ whorls, which are the least convex and exhibit a pellucid line, frequently brown, immediately beneath the suture. Last whorl very obliquely descending behind, narrowed below, and flattened somewhat above the aperture. Columella thickened with callus, white, parted off from the whorl above by an oblique circumscribing red line, truncated rather low down. Outer lip slightly thickened and effuse, and a little paler than the rest of the whorl, produced somewhat at its junction with the body-whorl, which in consequence has the appearance of rising suddenly after an oblique descent. Length 7 millims., diam. $3\frac{2}{3}$, aperture 2 long and wide.

Hab. Shortland Island, Bougainville Straits, in the decayed trunks of fallen trees (*Guppy*); Treasury Island (presented to the British Museum by *J. Brazier, Esq.*).

This is a larger species than *P. difficilis*, Semper, or *P. keraudreni*, Vignard, which appear to be very much alike. The slit in the columella is a trifle lower down, the columella itself is pale and marked off from the rest of the whorl by a red curved line, and the aperture is less produced or pouting along the lower margin.

30. Hargravesia polita, H. Adams, var.

Hab. Faro Island, Bougainville Straits; "in the higher parts of the island up to the summit, 1900 feet above the sea" (*Guppy*).

It is not stated by Adams (Proc. Zool. Soc. Lond. 1870, p. 795) from which island of the Solomon group the types were obtained. In all probability they were not from Faro, as the specimen from this locality varies somewhat in form, having a more conical spire, less convex whorls, and the aperture less produced laterally. Should these differences prove constant in a large series of specimens, I should be inclined to consider this form specifically distinct. *Hyalopsis tumida*, Pease (Amer. Journ. Conch. vii. p. 27), is the same as the present species.

31. Helicina moquiniana, Récluz.

Hab. "The island of Ugi, living in a region of coral-limestone at an elevation varying between 300 and 400 feet above the sea" (*Guppy*). San Christoval and Guadalcanar Islands (*Macgillivray*, in Brit. Mus.).

This species appears to vary in size, colour, the coarseness of the spiral striæ, in the acuteness of the central keel, and in the greater or less development of the dentiform projection at the base of the columella. I have no hesitation in pronouncing *H. spinifera* to be a very slight variation, and indeed *H. egregia* might almost be regarded in the same light.

32. Helicina egregia, Pfeiffer. (Plate XXXVI. figs. 10, 10 *a*.)

Hab. "From the coral-limestone region of the east island of the Florida group, on leaves" (*Guppy*).

The unique type of this species was collected by Macgillivray on the island of Guadalcanar, which is situated just to the south of Florida Island. The operculum is thin, and coloured precisely like that of *H. moquiniana*, Récluz, and its variety *H. spinifera*, Pfeiffer, all three being of a dark sanguineous red with the exception of the columellar margin, which is whitish. This species is not keeled at the middle like the two above-named forms, and is more finely striated, and consequently has a smoother surface.

The three specimens collected by Mr. Guppy are all differently coloured. One is exactly like the type (see fig. 272 in Sowerby's Monograph, Thesaur. Conch. vol. iii., and Conch. Icon. vol. xix. fig. 159); another lacks the broad zone on the upper surface; and the third is uniformly light purplish-red, the peristome and aperture being of a more decided red tint.

33. Helicina modesta, Pfeiffer.

Hab. Choiseul Bay, Shortland Island, and an islet in Treasury Harbour, Bougainville Straits (*Guppy*); Guadalcanar Island (*Macgillivray*, in British Museum).

The specimens described by Pfeiffer were said to have come from Tanna, one of the New Hebrides islands; but this certainly requires confirmation, as so many of the localities in Cuming's collection are erroneous. The figures in Sowerby's Monographs are all enlarged, those in the 'Thesaurus' being fairly accurate as regards form, but those in the 'Conchologia Iconica' are altogether unlike the species. The operculum of this little shell is white, concave in the middle, and is broadly thickened along the outer margin.

34. Helicina solomonensis. (Plate XXXVI. figs. 11, 11 *b*.)

Shell small, globose-conical, reddish or yellowish, pale at the apex. Whorls 4–4½, the least convex above, sculptured with lines of growth and fine spiral striæ both on the upper and lower surfaces, very faintly margined above at the suture; last whorl rounded at the periphery, obsoletely angled near the junction of the outer lip and the least descending in front, so that the faint angulation is visible for a short distance above the sutural line. Aperture somewhat semicircular and oblique, small; peristome slightly expanded; umbilical callosity yellowish or pellucid whitish, defined towards the the base of the columellar margin. Greatest width $4\frac{2}{3}$ millim., smallest 4; height 3½.

Hab. Faro, Shortland, and Treasury Islands.

The specimens from the last of the above islands were obtained "at a height of 900 feet above the sea."

This little species is of about the same size and form as *H. multicolor*, Gould, but is distinguished by the spiral sculpture. The operculum is greyish, becoming rather darker at the middle.

35. Pythia scarabæus, Linné.

Hab. Santa Anna Island, "living on a sandy swampy soil raised a few feet above the sea" (*Guppy*).

Of the five adult specimens from the above locality, which are of medium size (about 30 millims. long) and normally mottled and blotched, three are umbilicated and one imperforate. The variation in this respect has already been referred to in my account of the Land and Freshwater Mollusca of the 'Challenger' Expedition (Proc. Zool. Soc. 1884, pp. 261 and 268). *P. insularis* of Hombron and Jacquinot I regard as the same as this species.

Three specimens of the variety named *P. albovaricosa* by Pfeiffer were also collected by Mr. Guppy "on the low tract skirting the coast on the south-east side of San Christoval." Two of these specimens are coloured precisely like the types, which were said to have come from the island of Celebes, but the third is very remarkable, being totally white.

Three young specimens of the normal form, from Santa Anna Island, are clothed with a very thin epidermis which is produced into numerous parallel thin hair-like threads in the direction of the line of growth. At this early stage the shells are imperforate, and the columella has in consequence a somewhat different appearance.

36. Melampus fasciatus, Deshayes.

Hab. Rua Sura Island, off the north coast of Guadalcanar, found in crevices of a log on the shore (*Guppy*); Ysabel Island (*Brenchley* in Brit. Mus.).

This species apparently differs as much in size as colour, and is very widely distributed, there being in the British Museum specimens from the Keeling Islands, Louisiade Archipelago, New Hebrides, and Fiji. The largest specimens are generally whitish with transverse brownish bands, and the smallest are frequently of an almost uniform black-brown, or light olive-brown or dirty yellow, with only the faintest indications of transverse zones.

37. Melania amarula, Linné.

Hab. From a stream in Ugi Island.

The two specimens from this locality differ in form and the number of spines upon the angle of the whorls. One has a much longer body-whorl, and has seventeen spines, the other only eleven. The columella is orange, and the epidermis towards the lip villose, as in the variety called *M. cybele*, Gould.

38. Melania scabra, Müller.

Hab. Ugi Island.

I see no sufficient reasons for separating the few specimens obtained by Mr. Guppy from this variable and widely distributed species, with which several forms held distinct by Brot in his Monograph should, I think, be united. I have compared them with Indian examples, with which they agree very closely.

39. Melania salamonis, Brot.

Hab. Ugi Island.

The single specimen from this locality differs in colour from the type figured by Brot, being uniformly olive, except the upper spirally striated whorls, which, being more or less destitute of the epidermis, are paler, and exhibit a series of small red spots or short flames below the suture.

40. Melania fulgurans, Hinds.

Hab. Ugi Island.

This species has not, I think, been recorded from the Solomon Islands, although it has probably been known for some time to inhabit that group, for Mr. Brazier of Sydney presented, in 1879, four specimens from that locality to the British Museum. These and several obtained by Mr. Guppy show that the species is rather variable in painting. None have the zigzag lines of the typical form, but are chiefly ornamented with spiral series of reddish dots or short lines, sometimes falling into longitudinal rows, and the whorls below the suture are often blotched with a darker colour. Mr. Guppy's largest specimen (7 whorls remaining) is 40 millim. long.

41. Melania fastigiella, Reeve. (Plate XXXVII. fig. 1.)

Hab. "Imbedded in a dark calcareous loam exposed in the bank of a large stream at Sulagina on the north coast of San Christoval."

The specimens found by Mr. Guppy are not quite so slender as the type figured by Reeve, but agree with it exactly in all other respects. An important feature not referred to by Reeve is the presence of fine transverse liræ upon the body-whorl below the spined keel. The fine costæ and spiral striæ on the uppermost volutions are very constant in all specimens; and therefore I think it most probable that Brot's shell (Monogr. *Melania*, in Conch.-Cab. pl. 38. f. 2*a*) does not belong to this species.

Mr. Guppy was unable to discover any living specimens; those which were obtained being, however, well preserved and even retaining a certain amount of the epidermis, which is of a "yellowish brown" colour as described by Reeve, and not of the sombre tint depicted in his figure.

42. Melania, sp. (Plate XXXVII. fig. 2.)

Hab. Found "imbedded in a dark calcareous loam exposed in the bank of a large stream at Sulagina on the north coast of San Christoval" (*Guppy*).

Only one dead specimen was obtained of this species. It is ovately fusiform, consists of about 8 or 9 whorls, is longitudinally plicate, the folds being produced into short spines just beneath a depression a little below the suture. The plicæ are crossed by about three spirally striated grooves, and the body-whorl is strongly transversely ridged and grooved below the middle; the furrows also, as in the upper whorl, being finely striated in the same direction. Length 26 millim., width $9\frac{1}{2}$.

43. Melania verrucosa, Hinds.

Hab. The same as *Mel. fastigiella.*

The three shells obtained I am unable to separate from this species, which was described originally from specimens from New Ireland, a little to the north of the Solomon group. *M. damonis* of Brot appears to be very closely allied to this species, if not the same. As stated by the latter author, some specimens are more slender than others, as shown by the following measurements of two specimens with an equal number of whorls: length 20 millim., diameter $7\frac{1}{3}$; length 22 millim., diameter $6\frac{1}{2}$.

44. Melania subgradata. (Plate XXXVII. figs. 3, 3 *a*.)

Shell elongate, turreted, rather solid, covered with an (olive?) epidermis, and marked with fine longitudinal oblique red lines which extend from suture to suture. Whorls probably about 10, flat or even a little concave at the sides, shouldered above, usually with a spiral shallow groove and a few striæ near the shoulder, and marked with fine incremental striæ. Suture deep, slightly oblique. Last whorl long, finely transversely striated, most distinctly at the base.

Aperture elongate-pyriform, acute above, effuse at the base. Outer lip thin, sharp, arcuate, and prominent at the middle. Columellar margin rather thickly covered with callus, united above to the outer lip. Length of two specimens, consisting of five whorls, 30 and 25 millim.; diameter 11 and $10\frac{1}{2}$; aperture 14 and 12 long, 6 and 5 wide.

Hab. "Imbedded in a dark calcareous loam exposed in the banks of a large stream at Sulagina, north coast of San Christoval" (*Guppy*).

This species has a good deal the form of *M. queenslandica*, Smith, but has a more turreted spire, colour-markings, and more distinct spiral sculpture.

45. Melania ugiensis. (Plate XXXVII. fig. 4.)

Shell subulate, acuminate, beneath the epidermis (which is wanting in the specimens at hand), of a dirty pale livid or purplish tint. Whorls probably about 14 in number; the eleven remaining are a little convex, rather slowly enlarging, and sculptured with close-set obliquish fine riblets which are crossed by crowded spiral striæ. Last whorl large, with the riblets rather obsolete below the middle, and very close together, much more numerous than those upon the upper whorls. Aperture obliquely pear-shaped. Length 25 millim., diameter 8; aperture $8\frac{1}{2}$ long, $4\frac{1}{2}$ wide.

Hab. From a stream in Ugi.

Of this species only three dead specimens were obtained. They were all completely covered with a hard thickish coating of lime, so that no part of the sculpture was visible. This earthy covering was easily chipped off, and the ornamentation was revealed in most perfect condition. It is remarkable that the fine close riblets exist not only on the upper whorls but continue to the last, and are cut across by the spiral striæ, producing an almost granular aspect.

46. Melania sanctæ annæ. (Plate XXXVII. figs. 5, 5 *a*.)

Shell small, acuminately pyramidal, somewhat eroded towards the apex, covered with a yellowish-olive epidermis, and sometimes marked with a few indistinct reddish irregular spots and lines near the middle of the body-whorl. Whorls 5–6 remaining, flattish at the sides, divided by a slightly oblique distinct suture, all with the exception of the last one or two more or less distinctly longitudinally finely plicate; the plicæ are more conspicuous in some specimens than in others, being at times entirely eroded. The other sculpture consists of fine lines of growth and a few rather distant spiral striæ, which cut across the incremental lines and produce a puckered appearance. Aperture elongate, pyriform, pale bluish within. Length of specimen consisting of six whorls 13 millim., diameter 5; aperture 5 long and $2\frac{1}{2}$ wide.

Hab. "From a stream in the interior of Santa Anna" (*Guppy*).

This is a small species, somewhat like *M. boninensis* of Lea in form, but differently sculptured.

47. Melania guppyi. (Plate XXXVII. figs. 6, 6 *a*.)

Shell slenderly acuminate, covered with an olive-brown epidermis. Whorls about 14, divided by a very oblique deepish suture, concave above the middle and somewhat convex below it, and then contracted; ornamented with a few spiral series of nodules (about five on the upper whorls) and rather indistinct, very oblique and flexuous, longitudinal ridges, upon which the nodules rest, also exhibiting very sloping and flexuous lines of growth; the most conspicuous rows of granules are near the middle of the whorls. Aperture pyriform. Outer lip thin, remarkably sinuated above towards the suture and arcuately prominent below. Columellar margin oblique, straightish, covered with a callus, curving into the broad basal sinus. Length 31 millim., diameter 7; aperture 9 long, 4 wide.

Hab. "From the stomach and intestines of a fish living in the freshwater lake of Wailava in the island of Santa Anna" (*Guppy*).

This is a very remarkable and distinct species, with a very drawn-out spire, peculiar granuled sculpture, and a deeply sinuated labrum. I have much pleasure in naming it after Mr. Guppy.

48. Cerithidea cornea, A. Adams (var.).

Hab. From Mangrove swamps, Choiseul Bay (*Guppy*); Andai, New Guinea (*Tapparone Canefri*); Borneo (*Adams*).

The specimens from the Solomon Islands vary slightly from the Bornean shells in Cuming's collection. The ribs are somewhat farther apart, the body-whorl is rather more distinctly carinate at the periphery, the aperture a trifle larger, the lip being more expanded and more produced to the left over the channel at the base of the columella. The whorls, too, are somewhat higher, for in specimens of the same length I find about a whorl more in the specimens from the Solomon Islands than in the original types.

49. Nerita marmorata, Hombron and Jacquinot.

Hab. Found "living just above high-water mark on the surface of the coral-limestone coast, San Christoval" (*Guppy*); Solomon Islands (*Hombron and Jacquinot*).

This species was described by Reeve (Conchol. Iconica, vol. ix. sp. 47) under the name *N. oleagina*, a year after the publication of the Zoology of the 'Voyage au Pôle Sud' by Rousseau. Reeve's figure gives a better idea of the mottled colouring than that in Hombron and Jacquinot's Atlas, pl. 16. f. 15–17. Their figure of the operculum does not appear to be quite correct in outline, judging from those obtained by Mr. Guppy, none of which have the emargination on the columellar side in front.

The apical whorls in all examples are of a lemon-yellow colour, and the columellar margin between the teeth is generally suffused with the same tint. *Nerita marmorata*, Reeve, which is found in the Gulf of Suez, may in future be called *M. crassilabrum.*

50. Neritina cornea, Linné. (Plate XXXVII. figs. 7, 7 *b*.)

Hab. Found living on the stems of tree-ferns, betel-nut palms,

&c., in a marshy district in the interior of the Shortland Islands, Bougainville Straits; also from a stream in Choiseul Bay, and from the vicinity of Star Harbour on the south-east coast of San Christoval, found living on the trunks of trees 300 feet above the sea and about 150 feet above an adjacent stream.

The majority of the specimens from the above localities are very like Reeve's figure (Conch. Icon. f. 7*a*). One specimen, however, from a stream in Choiseul Bay, is worthy of special notice on account of its extraordinary size. It is as large as the shell figured by Gould (Wilkes's Explor. Exped. pl. xi. fig. 185) from Fiji, and, like it, has the edge of the columella furnished with about a dozen small denticles, agreeing in this respect with *N. subsulcata.* The portion of the specimen which equals an average-sized example is quite normally painted; but the rest or aftergrowth is mostly of a sombre olive-brown, with only very faint indications of the spiral mottled black zones. The operculum is quite similar to that of other specimens, but much thickened with flesh-red callus on the inner surface.

The distribution of this species has already been given by Von Martens in his monograph of the genus. In addition to the localities there enumerated, I may mention that in the British Museum there are specimens from Amboyna and the Admiralty Islands collected by the Challenger Expedition; and others from Guadalcanar, San Christoval, and Ysabel Islands of the Solomon group, presented by J. Macgillivray, Esq., and J. Brenchley, Esq.

51. Neritina subsulcata, Sowerby.

Hab. Streams in Treasury and Faro Islands, and at Choiseul Bay; also found living in numbers on the stems of tree-ferns, betel-nut palms &c., in a marshy district in the interior of the Shortland Islands; also from a stream in the vicinity of Star Harbour on the south-east coast of San Christoval; from a stream in the middle of the island of San Christoval 3–4 miles from the coast; from the sides of a freshwater stream, found at an elevation of 500 feet above the sea at Cape Keibeck, San Christoval, and finally from a stream in Ugi Islands.

Mr. Guppy informs me that this is the most widely distributed species of the genus which occurs in the Solomon group, and that when first picked off the rock it ejects a watery fluid possessing a powerful musky odour.

Some of the specimens are considerably eroded, and the erosion is always greatest in non-calcareous districts, where the carbonic-acid gas of the rain is not previously expended as a dissolving agent of limestone rocks.

Although this species very closely approaches *N. cornea,* it may, I think, be held distinct on account of its difference in coloration, the crenulated and straighter margin of the columella, and the slightly finer sculpture on the outer surface of the operculum, especially towards the outer curved margin.

52. Neritina dubia, Chemnitz.

Hab. From a stream, Shortland Islands.

The single specimen from this locality is of a dark olive tint, marked with slender zigzag black lines very closely packed together except upon the last half of the body-whorl, which is destitute of the black lineation but is quite distinctly spirally ridged, the ridges being about as fine as in *N. subsulcata.*

53. Neritina adumbrata, Reeve.

Hab. A stream in Choiseul Bay, and found living on the sides of a deep ravine worn by a stream in a soft calcareous rock, Ugi Island.

N. cuvieriana of Reeve (Conch. Icon. sp. 87), which may not be the form described by Récluz under that name, is certainly the same as this species. The specimen figured in the 'Conchologia Iconica' (figs. 57 *a*, *b*), is not half the size of some of the shells collected by Mr. Guppy. The figures are not good, and do not convey the shape correctly. The aperture narrows in front, and the columella is less sharply sinuated in the middle, and finely crenulated along the edge. As in some other species, the colour is rather variable, some examples appearing at a distance uniformly dark olive, but on closer inspection, especially on the upper whorls, exhibit spotted markings. Others are distinctly mottled and spotted all over, whilst others again are transversely banded. The red stain on the collumella is present in most specimens, but is only feebly indicated in some of the smallest. The operculum is white or of a flesh tint on the outer surface, and generally has a livid stain at the nucleus. It is rather smooth, exhibiting fine lines of growth and a few feeble longitudinal striæ. The inner surface is of a darker flesh tint, and has a slightly elevated pale obsolete ridge curving from the nuclear end to the middle of the columellar or straight side. The outer curved margin is also a little thickened within. The erect process is rather slender. The largest specimen has an extreme length of 34 millimetres.

54. Neritina pulligera, Linné.

Hab. Choiseul Bay and Ugi Island (*Guppy*); Guadalcanar Island (*Macgillivray*); and San Christoval (*Brenchley*).

Of the two specimens from Ugi one is peculiar in having only a slight trace of the orange-red colour of the aperture. In addition to the localities cited by Martens in his monograph of this genus (Conch.-Cab. ed. 2, p. 51), I might mention Queensland, Australia, on the authority of Tenison-Woods, and of a specimen in the British Museum presented by Mr. Wickham.

55. Neritina petiti, Récluz.

Hab. Treasury and Faro Islands.

This species also occurs at the Fiji Islands, where it was collected by Macgillivray. Its further distribution has been given by Martens in the Conchylien-Cabinet. His surmise that *N. californica* of

Reeve is the same species is confirmed by an examination of the type in the British Museum.

The specimens collected by Mr. Guppy are of a light olive-brown colour, and exhibit a fine reticulation and spotting with black from the violet apex to the middle of the last whorl.

56. Neritina olivacea, Le Guillou.

Hab. Streams in Treasury Island, and in a stream at Sulagina, San Christoval.

The specimens from the above locality differ from those collected by Cuming at the Philippine Islands in being rather smaller and in having the collumelar callus of a reddish tint except along the toothed edge, which is white. Some of the specimens exhibit a considerable amount of fine spotting and reticulating lines.

With this species I would unite *N. solium*, Récluz ; and perhaps the four following species, *N. bicolor*, Récluz, *N. subpunctata*, Récluz, *N. interrupta*, Récluz, and *N. souleyetana*, are merely varieties of the same species.

57. Neritina macgillivrayi, Reeve.

Hab. Streams in Faro Island (*Guppy*) ; streams in Guadalcanar Island (*Macgillivray*, in Brit. Mus.) ; and Ngau, Fiji group (*Brit. Mus.*).

The Fijian specimens are considerably larger than the type figured by Reeve, having an extreme diameter of 42 millims. All the specimens of this species which I have seen have the apex considerably eroded. The specimens obtained by Mr. Guppy are of small size, and may be adult shells, although having a maximum diameter of only 16 millims.

58. Neritina asperulata, Récluz.

Hab. Ugi Island, "living on the sides of a deep ravine worn by a stream in a soft calcareous rock" (*Guppy*).

This species has not been previously recorded from these islands. The specimens are smaller than those obtained by Mr. Cuming at the island of Luzon, but may not be adult ; the columella is of a uniform pale ochre tint. The operculum is almost precisely the same as that of *N. sanguinea* which I have described, but has a broader corneous border.

59. Neritina porcata, Gould.

Hab. In streams, Faro Island (*Guppy*) ; San Christoval, Solomon group, Fiji and Navigators Islands (*Brit. Mus.*).

Neritina sanguinea, Sowerby, is very like this species in many respects, but is smoother, being without the distinct ridges so characteristic of *N. porcata*.

60. Neritina variegata, Lesson.

Hab. Faro, Simbo, San Christoval, and Ugi Islands, and Choiseul Bay.

None of the specimens from the above localities are large, but are very variable in the style of their coloration, some from Ugi being precisely like *N. pulchra* of Sowerby, wrongly said to have been found at Panama. The operculum in all, however, is of the same slaty-black colour, with the pale spot at the nuclear end. The majority have the red stain on the columella more or less intense, but a few have the columella uniformly bluish-white.

61. Neritina turtoni, Récluz.

Hab. From a stream, Shortland Island, and found "imbedded in a dark calcareous loam exposed in the banks of a large stream at Sulagina on the north coast of San Christoval" (*Guppy*); Guadalcanar Island, in streams (*Macgillivray*, in Brit. Mus.).

The specimens from the Solomon Islands appear to be marked very much alike; they are all coloured with oblique, fine, more or less undulating or zigzag black and yellow lines, of which the latter are invariably the finest and indeed hair-like.

The largest specimens are those from Guadalcanar, measuring twenty-five millims. from the apex to lower margin of the aperture. The dead specimens from San Christoval retain the external polish and markings, although probably somewhat altered in tint; the black lines being of a dark slate-colour and the yellow lines white or lilac. The apertures and columella have lost all colour and are of a white chalky texture. In these specimens the columellar surface seems to be rather more convex than usual; but still I have no doubt they belong to this species.

62. Neritina brevispina, Lamarck.

Hab. From streams in Shortland, Treasury, and Ugi Islands.

The shells from the first and last of these localities closely resemble figures 24 *a, b* (*N. subgranosa*) in Reeve's monograph of this genus in the 'Conchologia Iconica.' Two specimens, however, are rather different, being smoother and very closely and finely lineated with black as in *N. penicillata*, Gould, which I regard as a variety of this species. The specimens from Treasury Island have the same kind of sculpture, but are entirely destitute of spines.

63. Neritina squarrosa, Récluz.

Hab. From streams in Treasury Island.

This species has not been previously recorded from the Solomon Islands. The only specimen obtained is grey, faintly zoned with a darker tint, has many of the triangular warts whitish, and the collumella yellowish; it is 27 millims. in diameter.

64. Neritina sanguisuga, Reeve.

Hab. Faro Island.

This species may be the *N. macrocephala* of Le Guillon, as suggested by Martens, but it does not correspond in all respects with the original description in the 'Revue Zoologique' for 1841. The Solomon-Island specimens are only half the length of the specimen figured by

Reeve, and some of them exhibit indistinct spotting and reticulation when held up between the light and the eye. The surface of the brown-black epidermis is without gloss, and under the lens appears finely rugose or subgranular. The operculum is rather narrow, with a projection on each side in front of nearly the same length, with a deep rounded sinus between, and the horny portion covers about half the surface.

The figure of the operculum of *N. cumingiana*, given by Martens (Conch.-Cab. ed. 2, pl. 4. fig. 4), somewhat resembles it.

N. magnifica, Reeve, and *N. scarabæus* of the same author, are the same species, but I doubt whether *N. sanguisuga* also belongs to it. The sculpture of the former is not quite the same, and the surface more glossy.

65. Navicella suborbicularis, Sowerby.

Hab. Faro, Treasury, and Ugi Islands, from streams (*Guppy*); Guadalcanar (*J. Macgillivray*); and San Christoval (*Brenchley*).

Both the varieties described by Martens (Conch.-Cab. ed. 2, p. 31, pl. 6. figs. 5–14), and also figured by Reeve (Conch. Cab. figs. 5, 5*a*), occur in the Solomon Islands, the black-striped variety being apparently of less frequent occurrence than the more finely reticulated form.

66. Unio guppyi. (Plate XXXVII. figs. 8–8 *b*.)

Shell elongate, very inequilateral, usually a little longer than twice the height, compressed, covered with a blackish-brown epidermis, exhibiting strong lines of growth and very faint radiating substriation, and marked with fine wrinklings at the eroded beaks, which are small and placed quite near the anterior extremity. Dorsal margin behind the umbones almost straight or the least excurved for some distance, then at an obtuse angle becoming oblique before rounding into the extremity, which is a little more sharply curved than the anterior end. Ventral outline either faintly excurved, straight, or the least concave. Interior bluish-white, most iridescent at the hinder extremity, generally stained in parts with olive-brown. Cardinal tooth of the right valve moderately large, four- or five-lobed at the top, situated just in front of the umbo. Between it and the outer margin is a short ridge, the space between the tooth and the ridge receiving the single, smaller, roughened and striated tooth of the left valve. Lateral tooth of the right valve long, obliquely truncate behind, fitting in between two teeth in the opposite valve. Anterior adductor scar deep, posterior superficial, squarish in front. Pedal scar in both valves under the cardinal tooth very deep. Ligament elongate, prominent.

Length 80 mm.; height 38; diameter 21.
" 70 mm.; " 35; " 18.

Hab. From streams in Shortland Island.

This species recalls to mind some of the forms from Australia and New Zealand. Its principal features are the elongate compressed form, dark brown colour, wrinkled apices, and coarse incremental lines. It is the only species as yet recorded from the Solomon Islands.

EXPLANATION OF THE PLATES.

Plate XXXVI.

Fig. 1, 1 *a*, 1 *b*.	*Helix* (*Nanina*) *nitidissima*, p. 589.
2, 2 *a*, 2 *b*.	—— (——) *solidiuscula*, p. 589.
3, 3 *a*, 3 *b*.	—— (*Corasia*) *tricolor*, var., p. 589.
4.	—— (*Geotrochus*) *guppyi*, p. 591.
5.	—— (——) *dampieri*, var., p. 592.
6.	—— (——) *cleryi*, var. *septentrionalis*, p. 592.
6 *a*.	—— (——) ——, var. *simboana*, p. 592.
6 *b*.	—— (——) ——, var. *meridionalis*, p. 592.
7, 7 *a*, 7 *b*.	—— (*Videna*) *sanctæ annæ*, p. 594.
8.	*Omphalotropis nebulosa*, p. 597.
9, 9*a*.	*Pupina solomonensis*, p. 597.
10, 10 *a*.	*Helicina egregia*, p. 598.
11, 11*a*, 11*b*.	—— *solomonensis*, p. 599.

Plate XXXVII.

Fig. 1.	*Melania fastigiella*, p. 601.
2.	——, sp., p. 601.
3, 3 *a*.	—— *subgradata*, p. 601.
4.	—— *ujiensis*, p. 602.
5, 5 *a*.	—— *sanctæ annæ*, p. 602.
6, 6 *a*.	—— *guppyi*, p. 603.
7, 7 *a*.	*Neritina cornea*, var., p. 603.
8.	*Unio guppyi*, exterior of left valve, p. 608.
8 *a*.	—— ——, exterior of right valve, p. 608.
8 *b*.	—— ——, hinge-margin of left valve, p. 608.

June 16, 1885.

Prof. Flower, LL.D., V.P.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of May 1885:—

The total number of registered additions to the Society's Menagerie during the month of May was 164, of which 67 were by presentation, 52 by purchase, 19 by birth, 7 by exchange, and 19 were received on deposit. The total number of departures during the same period, by death and removals, was 117.

The most noticeable additions during the month of May were as follows:—

Four Pucheran's Guinea-fowls (*Numida pucherani*) from Eastern Africa, presented by Commander C. E. Gissing, R.N., H.B.M. Vice-Consul at Zanzibar. This fine species has not lately been represented in the Society's series.

Examples of two species of Wild Cats of the genus *Felis*, presented by Frank Swettenham, Esq., acting British Resident of Perak, Malay Peninsula. Two of the Cats appear to be young examples of *Felis javanensis*; the third is a fine example of the rare *Felis marmorata*, remarkable for its long tail.

The following extracts were read from a letter addressed to the Secretary by Mr. J. Büttikofer, dated Leyden Museum, May 30, 1885:—

"On reading the interesting account of a visit to the birds'-nest caves near Elopura (British North Borneo) by Mr. Pryer, contained in the last part of the 'Procedings,' Dr. Jentink, the Director of our Museum, called my attention to a paper from the hand of the late Dr. Bernstein, our celebrated traveller in the Malay Archipelago, published in the 'Journal für Ornithologie' as early as 1859. You would oblige me very much by taking notice of this paper in the next number of the 'Proceedings,' as that may serve to correct any impression which might otherwise be entertained that the account of Mr. Pryer, with the adjoined report on the edible birds' nests by Mr. J. R. Green, is the first satisfactory solution of the question which has been offered. In order to show how thoroughly and successfully Dr. Bernstein has studied the question *in loco*, allow me to quote some of the most interesting parts of his exhaustive treatise."

Mr. Büttikofer then quoted passages from the article alluded to in the 'Journal für Ornithologie' for 1859, pp. 112–115; following from which it appeared that Dr. Bernstein had proved most conclusively from his own observations that the so-called edible nests of *Collocalia* are formed from the spittle of these birds, the salivary glands of which are abnormally developed during the breeding-season for this purpose.

The following extract was read from a letter addressed to the Secretary by Major-General Sir Peter Lumsden, K.C.B.:—

"The young Snow Leopards of which you inquire were captured on the 17th of November, 1884, on the southern slopes of the mountains which in Persia separate the valley of Zroabad from that of Torbut-i-Jani, crossed here by a road known as the 'Istoi pass,' and not very far from where the range is penetrated by the Heri-Rud river, separating Persia from Affghanistan. A native hunter had shot a 'mish' (or wild sheep) and had left it in order to go after another, then in sight, which having also secured, he returned to secure the first one, but on reaching it found a Leopardess greedily devouring it. He shot her, and on going up to the body found no less than five young kittens, perhaps ten days or a fortnight old, very active and savage; he with difficulty managed to secure two of them, which he brought back to camp. They were taken care of by a native, and carried along with us, fed on milk, meat, &c., to Kazan, from whence they were despatched on a mule to the British Agent in Herat, with instructions to send them on the first opportunity to Mr. Barnes, the Government Political Agent, Quettah, who was to arrange for their despatch to the Society's Gardens.

"Nawab Mirza Hassim Ali Khan, my personal assistant, took them over from the native huntsman who captured them, looked after their keep, and arranged everything for their despatch &c. These kittens within a very few days became quite tame."

Mr. Oldfield Thomas exhibited a specimen of a burrowing Rodent apparently allied to the rare *Heterocephalus glaber*, Rüppell, which had been recently presented to the Natural History Museum, and read the following letter from the donor:—

Junior Carlton Club,
Pall Mall, S.W.,
June 15, 1885.

Dear Sir,—

In looking at my journal I find the following notes under the date January 29, 1885:—

Gerlogobie, Ogardain, Central Somali-land.—"To-day the natives brought into camp a curious little creature, a sort of Mole, length 4½ inches, skin bare, with a few stiff hairs. Tail like that of a Hippo. Its toes armed with bristles, and its teeth like those of a Walrus. On being placed on the ground it commenced to dig furiously, using its teeth to loosen the earth with; its eyes were tiny, and its ears simply holes in the sides of its head."

This little creature, called "Farumfer" by the Somali, throws up in places groups of miniature craters, which exactly represent volcanoes in active eruption; when the little beasts were at work I used frequently to watch them, and found that the loose earth from their excavations was brought to the bottom of the crater, and sent with great force into the air in a succession of rapid jerks, but they themselves never ventured forth from the shelter of their burrows. I caught several by suddenly plunging a sharp-pointed instrument into the volcano, but never succeeded in making good skins of them.

Yours very truly,
E. Lort Phillips, F.Z.S.

Mr. Thomas remarked that no specimen of *H. glaber* had apparently been recorded since Rüppell's original example described just 40 years ago[1]; and that it was therefore a matter of great interest to determine whether that author's description of its characters and habits held good on the examination of further specimens, since it had been sometimes supposed that the original type was either immature or diseased, and on that account more or less hairless. This second specimen now proved that Rüppell was quite correct in his description, and that the normal state of the animal was as figured by him. It appeared, however, that the nearest affinities of *Heterocephalus* are not with *Spalax* and *Rhizomys*, as had been supposed by Mr. Alston[2], who had only Rüppell's figures to go upon, but with *Bathyergus* and *Georychus*, to the latter of which it was very closely allied, differing chiefly in its want of hair, much longer tail, and in its not possessing any premolar teeth.

[1] Mus. Senck. iii. p. 99, pl. vii. (animal), x. (skull), 1845.
[2] P. Z. S. 1876, p. 86.

Mr. Thomas hoped to be able to give a fuller description, with figures, of this interesting specimen at a future meeting of the Society[1].

Mr. W. T. Blanford exhibited the skull of a *Paradoxurus*, which he believed to be an undescribed form, and made the following remarks :—

The skull now exhibited was sent to me together with a skin, from which unfortunately nearly all the hair had been removed by moths, by the Rev. S. Fairbank, of Ahmednagar in the Bombay Presidency, about two years ago. He had received the specimen from Mr. F. Levinge, who procured it in his own garden at Kodaikanal, on the Palni (or Pulney) hills in the Madura district, Madras Presidency. The natives of the hills called the animal "Kārt-nai," or dog of the woods; and Mr. Fairbank suggested that it might be *Paradoxurus zeylonensis*, Pall. (*P. zeylanicus*, Kelaart), a species hitherto not known to occur elsewhere than in Ceylon. On comparison, however, the skull was found to differ not only from that of *P. zeylonensis*, but from all known species of *Paradoxurus*, in the excessive length of the anterior palatine foramina, which are more than 0·4 inch long (10 millimetres), and extend back as far as a line drawn through the posterior edges of the anterior upper premolars. In all other *Paradoxuri* the foramina are only half as long as in the skull from the Palni Hills, and do not extend back further than a line drawn through the hinder edge of the canines.

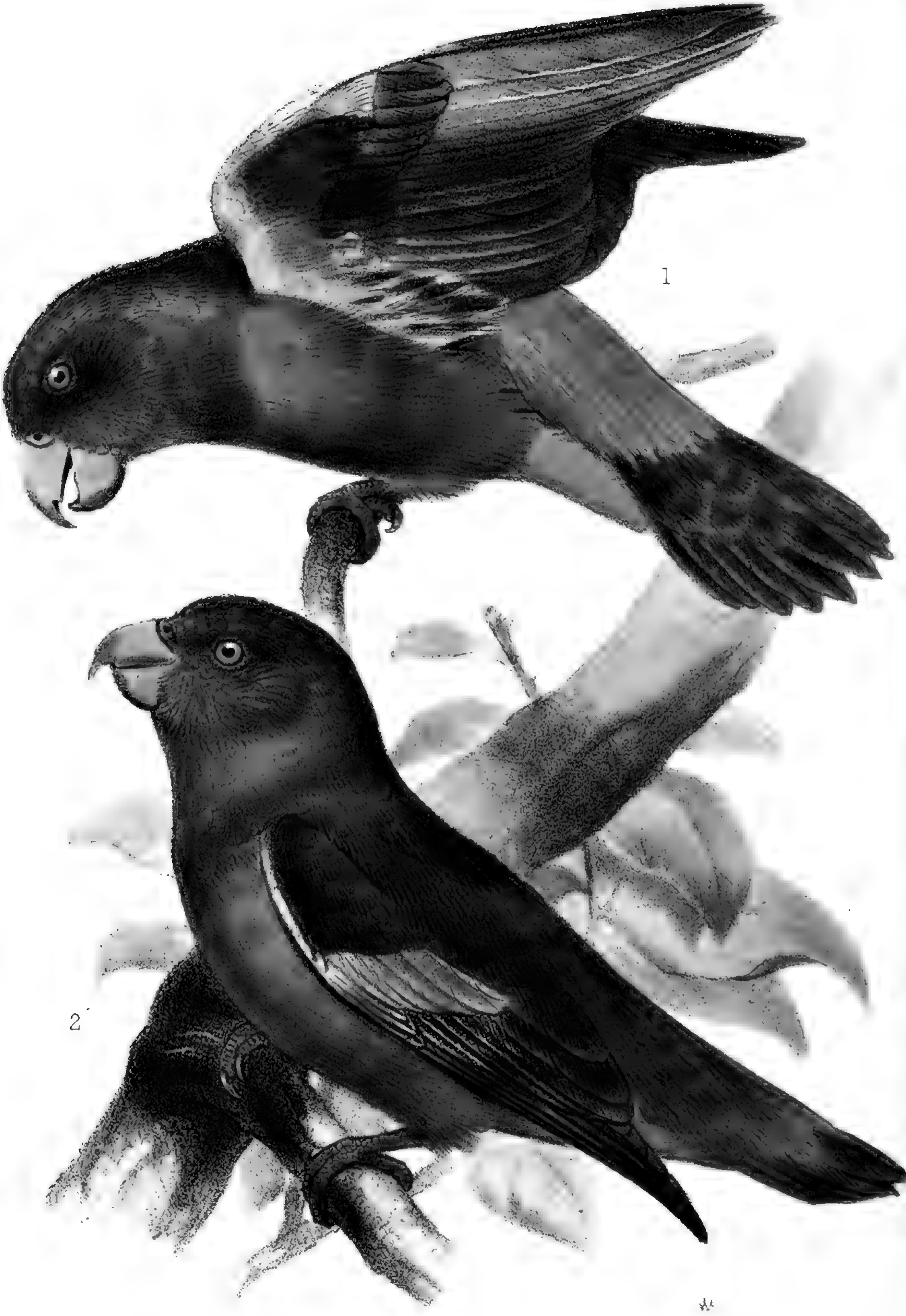
On searching amongst specimens in the British Museum, Mr. Oldfield Thomas (to whom I am indebted for much assistance in working out this and other questions connected with Indian zoology) called my attention to a flat skin presented some years since by Mr. F. Day, C.I.E., and different from that of any known *Paradoxurus*. This skin agrees with the description given by Mr. Fairbank, and with the remains of that sent by him; and although the exact locality whence it was procured is uncertain, Mr. Day tells me he is

[1] During the passage of these remarks through the press, I have had, through the kindness of the Directors of the Senckenberg Museum, the opportunity of examining the original type of *H. glaber* described by Rüppell. I find that Mr. Phillips's specimen, while referable to the genus *Heterocephalus*, represents a distinct and very much smaller species, which I would propose to call *H. phillipsi*, after its discoverer. It may be readily distinguished by the following comparative measurements:—

Skull:—	From Lambda to tip of nasals.	Basal length.	Greatest breadth.	Palate length.
	millims.	millims.	millims.	millims.
H. glaber	21·5	(*c*) 23·2	18·3	13·6
H. phillipsi	16·1	17·5	13·6	9·1
Hind foot:—				
H. glaber	21·2			
H. phillipsi	16·6			

The type of *H. phillipsi* is a fully adult female.

July 30, 1885. O. T.



J. Smit lith. Hanhart imp.

1. PSITTACULA SPENGLERI. 2. PSITTACULA CYANOCHLORA.

satisfied that it was obtained originally on one of the higher hill-ranges of Southern India.

I was at first uncertain whether, after all, this apparently new *Paradoxurus* might not be the *P. zeylanicus*, var. *fuscus* of Kelaart (Prod. Faun. Zeyl. p. 39; *P. montanus*, Kelaart apud Blyth, J. A. S. B. xx. pp. 161–184); but one of the typical specimens of this form in the British Museum proves to be a slightly browner variety of *P. zeylonensis*. I have very little doubt that the large tree-cat mentioned by Surgeon-Major Bidie in the Government 'Manual of the Nilagiri District,' p. 152, as having been obtained on the Animali hills and at Kotagiri on the Nilgiris, is the species to which attention is now called. If so this form has a considerable range in the southern portions of the Syhadri, or Western Ghats.

I hope before long to be able to lay before the Society a general note on the species of *Paradoxurus*, but meantime I propose to name the form here described after one of the best naturalists of Southern India, and to define it thus:—

PARADOXURUS JERDONI, sp. nov.

General structure apparently similar to that of the common *P. hermaphroditus* (= *P. musanga*, *P. typus*, *P. bondar*, &c.), except that the fur is uniform in length without longer black-tipped hairs on the body. Skull with anterior palatine foramina extending back as far as the anterior pair of premolars.

Colour of fur deep rich brown on head, shoulders, and limbs; back and sides the same but grizzled. Tail brown, with a long white tip. Hairs and underfur of the body brown, except a long subterminal grey ring on the longer hairs of the back and sides. Vibrissæ dark brown.

Dimensions approximately the same as in *P. zeylonensis* (head and body about 20 inches), or rather larger. The skull measures 4·45 inches in length from behind the occipital condyles to the anterior border of the premaxillaries.

Hab. The higher ranges near the west coast of Southern India.

The following papers were read:—

1. On a new Species of Parrot of the Genus *Psittacula*. By Dr. G. HARTLAUB, F.M.Z.S.

[Received May 26, 1885.]

(Plate XXXVIII.)

In a small collection of birds' skins from Baranquilla, presented of late to the Bremen Museum, I found a single specimen of a typical *Psittacula*, apparently quite adult and very probably a male. After having compared this little bird with the *Psittaculæ* of our collection—(1) *Ps. passerina*, from S.E. Brazil, (2) *Ps. cyanochlora*, Natt., from

North Brazil, not to be confounded with *Ps. passerina*, (3) *Ps. cyanopyga*, from the island of Tres Marias, (4) *Ps. cœlestis*, and (5) *Ps. conspicillata*,—and after having searched most assiduously, but without success, for a description in the systematical works, I think that I am justified in describing my *Psittacula* as of a new species. May I be allowed to name it after my friend Dr. W. Spengel, a well-known zoologist and the able Director of the Bremen Museum.

PSITTACULA SPENGELI, sp. nov. (Plate XXXVIII. fig. 1.)

Minor: rostro pro mole magno et valde robusto; læte et dilute psittacino-viridis: pileo lætius et purius tincto; gastræo nonnihil in flavidum vergente; tergo infimo, uropygio et supracaudalibus dilute azureis; subalaribus prope marginem internum alæ ex azureo-malachitaceis, dein intense cobaltino-cyaneis: tectricibus remigum sec. ord. uropygio concoloribus; alula spuria nigro-cærulescente; scapularibus dorso concoloribus; rectricum pure et dilute viridium pogoniis internis subvirescenti-flavis, mediis totis viridibus; subcaudalibus nitide et dilutissime viridibus; rostro pallido; pedibus incarnatis. Long. tot. circa 107 *millim.; alæ* 81 *millim.; caud.* 30 *millim.*

The colour of the upper parts is a light parrot-green, finer and purer on the crown and the sides of the head; underparts somewhat lighter with a faint yellowish shade; rump and upper tail-coverts of a *fine light turquoise-blue* (the same as in *Ps. cyanopyga*); greater wing-coverts of the same colour; primaries black on the inner and green on the outer webs; under wing-coverts near the margin of the wing of the same light turquoise-blue, but nearer the body of a fine blue; tail-feathers light green, the inner webs of the lateral rectrices yellow, with an indistinct greenish shade; under tail-coverts of a very light yellowish-green; beak very large, whitish; feet flesh-coloured.

Psittacula spengeli resembles *P. cyanopyga* in the turquoise-colour of the rump; but differs from it in its smaller size, in the much larger beak, in the cobalt-blue spot on the inner wing-coverts, and in the yellow inner webs of the rectrices. In *Psittacula cyanochlora*, Natt. (*passerina*, ♂ jr., Finsch), the inner wing-coverts are very much like those of *Ps. spengeli*; but the colour of the rump is, as in the former species, a brilliant emerald-green, and the inner webs of the rectrices are not yellow but green with yellowish margins. *Psittacula cyanochlora* is altogether a larger bird with a much smaller beak. The cobalt-blue colour of some of the tectrices of the primaries, so apparent in *Ps. cyanochlora*, is entirely wanting in *Ps. spengeli*.

So far as I know, *Psittacula spengeli* is the only member of this lovely little group in which the colour of the inner wing-coverts repeats that of *Ps. passerina* &c., and the colour of the rump that of *Ps. cyanopyga*.

I take this opportunity of sending for exhibition a typical specimen of *Ps. cyanochlora*, Natt. MS., which, as already observed, has been

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J. Smit lith. Hanhart imp.

RALLICULA RUBRA

considered by Dr. Finsch as the young male of *Ps. passerina*, but which I believe to be a distinct species. It may be described as follows:—

PSITTACULA CYANOCHLORA. (Plate XXXVIII. fig. 2.)

♂. *Supra psittacino-viridis, nonnihil obscurius adumbrata; capitis lateribus et gastræo toto dilutius et subflavescenti-viridibus; tergo, uropygio et supracaudalibus pulchre smaragdino-viridibus; rectricibus viridibus, pogoniis internis marginem versus flavicantibus; alarum tectricibus minoribus dorso concoloribus majoribus (remig. sec. ord.) cyanescentibus, in malachitaceum vergentibus, nonnullis subelongatis et angustatis, cobaltino-cæruleis; subalaribus pulchre et extense cobaltinis; margine interno alari e malachitaceo viridi; rostro toto pallido; pedibus incarnatis: crassitie* Ps. passerinæ.

Hab. Rio Brancho (*Natterer*).

There is a young male *Ps. passerina* in the Bremen Collection which resembles *Ps. cyanochlora* in most respects. But there are some differences, and amongst them there is *one* which I consider to be rather important. In this "young male" of Caracas the *cobalt-blue spot on the subalares is very small and has evidently not yet reached its full extension.* In *cyanochlora* you will observe that the cobalt-blue of the subalares has the *greatest possible extension*, just as in the *old male* of *passerina*. Now this is very curious, and very much in favour of my opinion.

The colour of the *tectric. major.* is very similar in the Caracas bird and in *Ps. cyanochlora*, but it is brighter in the latter. The curious one or two narrow elongated dark-blue feathers are to be found in both birds.

The emerald-green colour of the rump is also the same in both birds, it being only a little brighter in *Ps. cyanochlora*.

The green colour of the upper parts is much lighter and purer in the Caracas bird, and the sides of the head and the whole under-parts are of a different green, finer, more emerald, and less ellowish than in *Ps. cyanochlora*.

2. Report on the Collection of Birds formed during the Voyage of the Yacht 'Marchesa.'—Part VI. New Guinea and the Papuan Islands. By F. H. H. GUILLEMARD, M.A., M.D., F.L.S., &c.

[Received June 2, 1885.]

(Plate XXXIX.)

The 'Marchesa,' on leaving the Moluccas, proceeded to the islands lying off the north-west coast of New Guinea. Batanta and Waigiou were first visited; and from the former, in the neighbourhood of a fine bay discovered at the east end (which was roughly surveyed, and named after the yacht), several specimens of Wilson's Bird of Paradise were obtained. In Waigiou, during the month of October, we found many females and immature males of *Paradisea rubra*, but the male in full plumage seemed very rare. Our search for the lovely *Rhipidornis gulielmi* III. was quite unsuccessful, and though I inquired of many natives concerning it, none of them had any knowledge of it. Leaving some hunters both in this island and Salwatti, we proceded to Dorei Bay, where three Dutch missionaries are stationed; the only white men in the whole of Dutch New Guinea. These gentlemen were of great help to us, and it was through their assistance that we were able to obtain so large a collection of birds from the slopes of the Arfak mountains; a region that we ourselves were unfortunately unable to visit in person, owing to our restricted time and the fact that our flour and other provisions had already come to an end. After visiting Jobi, an island that proved, ornithologically speaking, very unproductive for us, save in specimens of *Paradisea minor*, we returned to Dorei Bay. After a short stay for arranging our Arfak specimens and various other purposes, we proceeded on our return journey; and on arriving at Samatee in the island of Salwatti, we were pleased to find that our hunters had succeeded in obtaining for us a living specimen of the exquisite Twelve-wired Bird of Paradise (*Seleucides nigricans*). The island, however, not proving very rich in bird-life, we decided to go southward to Mysol, and found our way with some little difficulty through a network of small islands and shoals to Efbee, a little village on the south coast. Here we left five of our hunters with directions to proceed if possible to the west part of that island, and, after making a short survey of the harbour, we sailed for Amboina in order to re-provision the ship.

The Aru islands were the next localities visited by the 'Marchesa,' but the result was singularly unsuccessful. The season was unhealthy, and the ship's company suffered considerably from fever and scurvy. We accordingly returned to Mysol, picked up the hunters we had left upon the island, and, merely touching for a day or two at Batchian *en route*, we anchored once more in the roadstead of Ternate.

The collection thus obtained was a very large one, and numbered examples of close on two hundred and thirty species, of which two hundred and thirteen are noticed in the following pages. The collection of the Birds of Paradise was an exceedingly rich one, consisting of *Parotia sexpennis*, *Lophorhina superba*, *Paradigalla carunculata*, *Astrapia nigra*, *Epimachus speciosus*, *Drepanornis albertisi* and *D. bruijni*, *Ptiloris magnifica*, *Seleucides alba*, *Semioptera wallacei*, *Paradiseæ minor*, *apoda*, and *rubra*, *Diphyllodes speciosa*, *chrysoptera*, and *wilsoni*, *Cicinnurus regius*, and *Xanthomelus aureus*. The series of many of the above were very large, and the whole formed what is without doubt the finest collection that has hitherto been brought from New Guinea and its islands. But the thoroughness of the work of previous explorers, such as Wallace, Beccari, Von Rosenberg, and D'Albertis, is shown from the fact that among the many hundred skins obtained by the 'Marchesa's' party, not one single new species occurs, although fresh localities have been assigned to many. The expedition likewise failed in solving the problem of the nesting of the *Paradiseidæ* in spite of every inquiry having been made, and large rewards offered for the eggs of any of the species. Among many living birds brought back by the 'Marchesa,' and presented by Mr. C. T. Kettlewell to the Society, were three fine examples of *Paradisea minor*, which have now been in the Gardens for nearly a year and are still in good health. The *Seleucides* unfortunately died on the voyage home.

The present paper concludes the series on the birds collected during the 'Marchesa's' voyage. It is to be regretted that, in the present days of ocean yachting, more yacht-owners do not follow Mr. Kettlewell's example, and strive by private enterprise to add somewhat to our knowledge of those countries that have been left so long unexplored.

1. HALIASTUR GIRRENERA (Vieill.).

Haliastur girrenera, Salvad. *op. cit.* vol. i. p. 15.

a. *Jr.* Waigiou.

2. BAZA REINWARDTI (Müll. et Schleg.).

Baza reinwardtii, Salvad. *op. cit.* vol. i. p. 26.

a. ♂. Dobbo, Aru.
b. Aru.
c. Waigiou.

Iris yellow; tarsus and feet yellow; bill dark slate. Length (example *a*) 40 centims.; wing 29 centims.

Salvadori does not mention the occurrence of this species in Waigiou.

3. ASTUR LEUCOSOMA (Sharpe).

Leucospizias leucosomus, Salvad. *op. cit.* vol. i. p. 42.

a. ♀. Arfak (*Bruijn*).

The feet and tarsi are yellow in the dried skin, and are doubtless so in the living bird.

4. ASTUR POLIOCEPHALUS (G. R. Gr.).

Urospizias poliocephalus, Salvad. *op. cit.* vol. i. p. 45.

a. ♂. Wammar, Aru.

Iris brown; bill black; skin round eye and at base of bill orange; feet orange, claws black. Length 37·8 centims.; wing 21·2 centims.

5. ASTUR TORQUATUS (Cuv.).

Urospizias torquatus, Salvad. *op. cit.* vol. i. p. 60.

a. ♀. Batanta.

Batanta is a new locality for this species, but Wallace obtained it in Waigiou.

6. Astur melanochlamys (Salvad.).

Urospizias melanochlamys, Salvad. *op. cit.* vol. i. p. 63.

a. ♂. Arfak (*Bruijn*).

Mr. Gurney, who has kindly assisted me in the identification of many of the birds of prey collected during the voyage of the 'Marchesa,' writes:—"This specimen agrees with the description given in Salvadori's Orn. della Pap. with the following exceptions:—The under wing-coverts are whole-coloured dark maroon like the breast, except the lowest row, which are pale fawn. Also no spots are visible either on remiges or rectrices, and the bill is only partially black, the lower mandible and the sides of the upper, next the gape, being horn-yellow."

7. Cacatua triton (Temm.).

Cacatua triton, Salvad. *op. cit.* vol. i. p. 94.

a. ♂. Salwatti.
b. ♀. Mysol.
c. Arfak.

Iris brown; bill and legs black. Length 48·6–49·5 centims.; wing 28·5–30 centims.

The Arfak bird is considerably larger than the other birds. The crest is very full and long, not pointed, and not recurved. From the base of the bill to the end of the crest is 17·0 centims., as against 13·0 and 13·5 centims. of the other examples. The bill also is much larger.

8. Microglossus aterrimus (Gm.).

Microglossus aterrimus, Salvad. *op. cit.* vol. i. p. 107.

a. ♂. Salwatti.
b. ♂. Dorei (*vix ad.*).
c. ♀. Waigiou.
d. Jr. Momos, Waigiou.

Iris dark brown; bare skin red; bill and legs black. In the young bird the maxilla is dark brown, whitish at tip; the mandible stone-colour, white at the tip; the feathers of the abdomen finely barred with light yellow, and the tail-feathers much pointed.

This species gets extremely tame in confinement, appears torpid, and is very deliberate in its movements.

9. Nasiterna bruijni, Salvad.

Nasiterna bruijni, Salvad. *op. cit.* vol. i. p. 115.

a, b. ♂. Arfak.
c. ♀. Arfak.

Obtained from Mr. Bruijn of Ternate.

10. Nasiterna pygmæa (Q. et G.).

Nasiterna pygmæa, Salvad. *op. cit.* vol. i. p. 117.

a. ♂. Mysol.
b. ♀. Mysol.

Iris, bill, and feet brown; length 9·4–10·0 centims. (Salvadori gives 7·8 centims.!); wing 5·7–5·9 centims.

11. TANYGNATHUS MEGALORHYNCHUS (Bodd.).

Tanygnathus megalorhynchus, Salvad. *op. cit.* vol. i. p. 129.

a, b. ♂. Momos, Waigiou.
c, d. ♀. Momos.
e. ♂. Samatee, Salwatti.

Iris whitish yellow; bill scarlet; tarsus dull olive. Length 38·0–42·3 centims. Salvadori gives 43–46 centims. as the total-length measurements; these have possibly been taken from the dried skin. The Salwatti bird is bluish on the head, not green.

12. APROSMICTUS DORSALIS (Q. et G.).

Aprosmictus dorsalis, Salvad. *op. cit.* vol. i. p. 140.

a. ♂. Batanta.
b. ♀. Andai.
c. ♀. Chabrol Bay, Waigiou.
d. ♀. Samatee, Salwatti.
e. New Guinea.

Iris orange; bill black, red at base of maxilla; tarsus dirty yellow, sometimes olive-green or brownish.

One of the females only has the interscapulars green.

13. PSITTACELLA BREHMI (Rosenb.).

Psittacella brehmii, Salvad. *op. cit.* vol. i. p. 145.

a. ♂. Arfak.
b. ♀. Arfak.

Obtained by the hunters in the neighbourhood of Hatam.

The bill of the male is much larger than that of the female.

14. CYCLOPSITTACUS OCCIDENTALIS, Salvad.

Cyclopsittacus occidentalis, Salvad. *op. cit.* vol. i. p. 152.

a, b. ♂. Samatee, Salwatti.

Iris brown; bare space round eye blackish; bill black; tarsus dark greenish. Length 23·0 centims.; wing 11·3 and 11·6 centims.

Very like *C. blythi* from Mysol, but quite distinct in having the azure subocular spots, and differing from *C. desmaresti* in wanting the blue nuchal patch.

15. CYCLOPSITTACUS BLYTHI, Wall.

Cyclopsittacus blythi, Salvad. *op. cit.* vol. i. p. 154.

a–d. ♂. Mysol.
e–g. ♀. Mysol.

Iris brown; bill black; tarsus dull olive. Length 22·8–25 centims.; wing 11·3–11·7 centims.

This series shows *C. blythi* to be a perfectly good species. The individuals vary a good deal in colour, some having the underparts much brighter than others. Thus in one they are almost grass-green, while in another, a female, there is a broad pectoral band of orange, and the breast and abdomen are tinged with that colour. In two males and a female, all of which have a general green rather than orange colouring, a feather or two beneath the eye, corresponding to the position of the subocular spot in *C. occipitalis*, are slightly tipped with greenish blue.

16. Cyclopsittacus diophthalmus (Hombr. et Jacq.).

Cyclopsittacus diophthalmus, Salvad. *op. cit.* vol. i. p. 158.

a–d. ♂. Mysol.

e–h. ♀. Mysol.

Iris brown; bill black; feet dull olive. Length 14·5–15·4 centims.; wing 8·3–8·9 centims.

Besides the absence of the red on the cheeks, the female differs from the male in the red not shading into golden yellow on the vertex as in the latter.

17. Cyclopsittacus aruensis (Schleg.).

Cyclopsittacus aruensis, Salvad. *op. cit.* vol. i. p. 161.

a, b. ♂. Dobbo, Aru.

Iris dark brown; tarsus olive-green; bill dark slate. Length 15·8, 16·2 centims.; wing 8·6, 8·4 centims.

18. Geoffroyus pucherani, Bp.

Geoffroyus pucherani, Salvad. *op. cit.* vol. i. p. 184.

a. ♂. Batanta.

b. ♀. Batanta.

c. ♂. Waigiou.

d, e. ♂. Mysol.

Iris greyish yellow; bill, maxilla of ♂ red, white at the tip, mandible dark slate, both slate-colour in the ♀; tarsus olive-green. Length 27·5–28·0 centims.; wing 15·0–17·0 centims.

19. Geoffroyus jobiensis (Meyer.)

Geoffroyus jobiensis, Salvad. *op. cit.* vol. i. p. 187.

a. ♂. Ansus, Jobi.

b. ♀. Ansus.

Iris yellow; bill, in male maxilla red, mandible black; in the female both black; feet olive-grey. Length 27·2; wing 16·6 centims.

The red of the back is brighter than in *G. pucherani*; the under wing-coverts are light cobalt, not azure, and in the female the head is of a clearer brown.

20. Eclectus pectoralis (P. L. S. Müll.).

Eclectus pectoralis, Salvad. *op. cit.* vol. i. p. 196.

a–c. ♂. Waigiou.

d, e. ♀. Waigiou.

f. ♂. Batanta.
g. ♂. Dobbo, Aru.

Iris red in the male, yellow or orange in the female. Maxilla of male rosy red, mandible black; bill of female entirely black; feet dull olive-green. Length of birds from N.W. islands, 38·7–41·4 centims.; wing 24·8–27·0 centims. The Aru bird is larger (44·4 and 28·0 centims.); but does not otherwise differ. A Waigiou male is partially albino, having the 1st, 4th, and 7th primaries of the left side, and the 1st, 3rd, and 7th of the right snowy white.

21. DASYPTILUS PESQUETI (Less.).

Dasyptilus pesqueti, Salvad. *op. cit.* vol. i. p. 216.

a. Arfak.
b, c. Dorei.

All in similar plumage, except that in one the inner primaries are not tipped with red. These birds were obtained by the hunters; I never saw the species except one specimen in confinement, in the house of Mr. van Bruijn Morris, the Resident of Ternate. It was fed almost entirely upon bananas.

22. LORIUS LORY (Linn.).

Lorius lory, Salvad. *op. cit.* vol. i. p. 223.

a–c. ♂. Waigiou.
d–f. ♀. Waigiou.
g. Waigiou?
h, i. ♂. Andai.
k. ♂. Mysol.
l. Salwatti.

Iris light yellow in the adult, yellowish brown in immature birds. Bill bright orange-red; tarsus black. The individual marked "Waigiou?" has the throat and breast red, and the blue of the nape does not join that of the under surface. It thus corresponds to Salvadori's *L. erythrothorax*, but is evidently only a variety of *L. lory*. One of the examples from Andai is immature, and has the greater series of under wing-coverts yellow, with black tips, and the middle and lesser striped red and blue. The two median rectrices are green subterminally, and there are some scarlet feathers intermixed with the blue of the mantle. The only example obtained from Salwatti is characterized by the large extent of blue occupying the throat.

This species was found to be extremely abundant in Waigiou.

23. EOS WALLACEI, Finsch.

Eos wallacei, Salvad. *op. cit.* vol. i. p. 255.

a. ♀. Napriboi, Waigiou.

Iris "brick colour;" bill orange; tarsus greyish. Length 29·0 centims., wing 15·0 centims. A much brighter species than the Moluccan representative, *E. riciniata*, the red being more intense.

24. Eos fuscata, Blyth.

Eos fuscata, Salvad. *op. cit.* vol. i. p. 263.

a. ♂. Andai.

Iris, inner ring orange, outer white; bill orange; tarsus black; pectoral bands and abdomen red. Another individual, obtained alive from Jobi, was also of the red variety.

25. Chalcopsittacus ater (Scop.).

Chalcopsittacus ater, Salvad. *op. cit.* vol. i. p. 269.

a, b. ♂. Samatee, Salwatti.

c, d. ♀. Samatee.

e–h. ♂. Efbe, Mysol.

i, k. ♀. Efbe.

Iris, inner ring yellow, outer red; bill and feet black. Length 36–39 centims.; wing 18·5–19·8. These measurements are considerably in excess of those given by Salvadori (long. 33 centims., wing 17–18 centims.).

In this series the Mysol birds can at once be distinguished from those of Salwatti by the brighter blue of the back and uropygium, and by the tendency to red coloration in various parts of the body. Thus, in all the examples *e–k* the tibials are more or less red, in some very brightly so. There is no trace of this in any of the birds from Salwatti. All the Mysol birds have the feathers of the forehead washed with red, all have the carpal margin more or less marked with that colour, one of them very strongly so, and in four individuals the greater series of under wing-coverts are similarly characterized, while some of the primaries have a patch of reddish yellow on the inner web. While in Mysol I twice saw a bird in a flock of others, which had the front part of the head bright red, apparently much as in *C. scintillatus*.

This species was abundant in Mysol, in flocks of from 10 to 20 individuals. One that lived in confinement on board the 'Marchesa' for some months became excessively tame.

26. Chalcopsittacus scintillatus (Temm.).

Chalcopsittacus scintillatus, Salvad. *op. cit.* vol. i. p. 274.

a, b. ♂. Dobbo, Aru.

Iris yellow; bill and tarsus black.

27. Trichoglossus cyanogrammus, Wagl.

Trichoglossus cyanogrammus, Salvad. *op. cit.* vol. i. p. 279.

a–e. ♂. Mysol.

f–i. ♀. Mysol.

k. ♀. Chabrol Bay, Waigiou.

l, m. ♂. Salwatti.

n. ♂. Batanta.

o. ♀. Batanta.

p. ♀. Andai.

Iris orange-red; bill reddish orange; feet brownish olive. Length 25·5–29·0 centims.; wing 13·0–14·7 centims.

28. Trichoglossus nigrigularis, G. R. Gr.

Trichoglossus nigrigularis, Salvad. *op. cit.* vol. i. p. 292.

a–g. ♂. Dobbo, Aru.

h. ♀. Dobbo.

Iris orange; bill bright orange-red; feet greyish black. Length 27·0–31·7 centims.; wing 14·8–15·5 centims.

The last of the series has the breast yellowish orange, and the feathers tipped with green, not dark blue. There is a large amount of variation among the individuals, the abdomen being green in some, in others bluish black. In one, the nuchal collar is yellow-orange, much marked with red, instead of greenish yellow, as it is usually.

T. nigrigularis, a common bird at Dobbo especially, differs from *T. cyanogrammus* in the greater length of tail and wing.

29. Trichoglossus rosenbergi, Schleg.

Trichoglossus rosenbergi, Salvad. *op. cit.* vol. i. p. 298.

a. ♂.

Iris yellow; bill scarlet; tarsus dull olive-green. Length 23·5 centims., wing 12·4, tail 7·5, tarsus 1·6.

This bird was obtained from a native of Dorei Bay, and was kept in captivity for some time. It agrees in almost every particular with Salvadori's description, but is smaller. It is also much smaller than the example of *T. rosenbergi* in the British Museum. The only noticeable difference in the plumage is that the inner web of the first primary is yellow washed with red, the next is more red, and so on till the fourth, which is entirely red. The entirely blue head, the broad yellow nuchal collar, the narrow brownish-red collar above it, and, lastly, the red inner webs of the primaries, serve at once to distinguish this species from *T. cyanogrammus*.

30. Neopsittacus muschenbroeki (Rosenb.).

Neopsittacus muschenbroekii, Salvad. *op. cit.* vol. i. p. 300.

a, b. Arfak.

c, d. *Vix ad.* Arfak.

e, f. *Jr.* Arfak.

g. *Jr.* Arfak (*Bruijn*).

h. Arfak (*Bruijn*).

Examples *c* and *d* are nearly adult, but the tips of the greater series of under wing-coverts are dull greenish brown. Examples *e* and *f* have but a slight amount of red on the breast, but in *h* this colour commences at the chin.

31. Coriphilus wilhelminæ (Meyer).

Coriphilus wilhelminæ, Salvad. *op. cit.* vol. i. p. 302.

a. ♀. Arfak (*Bruijn*).

32. Coriphilus placens (Temm.).

Coriphilus placens, Salvad. *op. cit.* vol. i. p. 303.

a. ♂. Chabrol Bay, Waigiou.

b, c. ♀. Chabrol Bay.
d. Juv. ♂. Mysol.
e. ♂. Arfak.

Iris red or yellow; bill and feet bright red. Length 17·7–18·5 centims.; wing 8·6–9·0 centims.

The Arfak bird has no yellow on the first three primaries, in the others the first two only are without the yellow patch; the head is more distinctly yellow. The species has, I believe, not been previously obtained from this district.

33. Oreopsittacus arfaki (Meyer).

Oreopsittacus arfaki, Salvad. *op. cit.* vol. i. p. 315.

a. ♂. Arfak.
b. ♀. Arfak.

34. Charmosynopsis pulchella (G. R. Gr.).

Charmosynopsis pulchella, Salvad. *op. cit.* vol. i. p. 317.

a–c. ♂. Arfak.
d. ♂ *vix ad.* Arfak.
e. ♀ *vix ad.* Arfak.
f. Jr. ♂. Arfak.

The thighs are slightly streaked with yellow in all. The young bird has the plumage of the adult, except that the breast is greenish and unstriped with yellow. It is also peculiar in having the inner webs of the flight feathers (beginning with the third) yellow towards the base. This seems to be a not uncommon characteristic of immaturity in other allied genera.

35. Charmosyna papuensis (Gm.).

Charmosyna papuensis, Salvad. *op. cit.* vol. i. p. 320.

a–c. ♂. Arfak.
d–g. ♀. Arfak.
h–k. Vix ad. Arfak.
l. Jr. Arfak.

In all the last four examples, the inner webs of some of the primaries at the base are yellow. The individual *l* has the under surface barred, and the tail short.

The long tail-feathers of this species appear to be naturally wavy from their first appearance.

36. Charmosyna josephinæ (Finsch).

Charmosyna josephinæ, Salvad. *op. cit.* vol. i. p. 325.

a. ♂. Arfak (*Bruijn*).

37. Cuculus canoroides, S. Müll.

Cuculus canoroides, Salvad. *op. cit.* vol. i. p. 328.

a. ♂. Momos, Waigiou, Nov. 12.
b. ♀. Momos, Oct. 25.
c, d. Jr. Waigiou, Nov. 12 and 15.
e. ♀. Wammar, Aru, Dec.

Iris yellow, brown in the young bird; bill black, greenish or yellowish at base of lower mandible; tarsus chrome-yellow. Length of example *b*, 33·4 centims.; wing 20·5 centims.

None of the above are in perfect plumage.

38. CHRYSOCOCCYX MEYERI (Salvad.).

Lamprococcyx meyerii, Salvad. *op. cit.* vol. i. p. 346.

a. ♀. Arfak.

Bill black; feet ash-coloured. Wing 9·4 centims. This individual has the whole sinciput chestnut, which was found to be the case in the only six females examined by Salvadori, though the colour was more restricted in some cases than in others. It is therefore not improbable that it is a constant sexual peculiarity.

39. ? EUDYNAMIS RUFIVENTER (Less.).

Eudynamis rufiventer, Salvad. *op. cit.* vol. i. p. 368.

a. ♂ *ad.* Traitors Islands (N. of Jobi I.).

b. ♂ (?). Traitors Islands.

c. ♂ (?). Traitors Islands.

d. ♀. Waigiou.

The above birds were all obtained from Mr. Bruijn of Ternate, and are unaccompanied by notes on the colour of the soft parts. The first, *a*, is a male in full plumage; *b*, also marked ♂, has the head, neck, and interscapulars shining bluish green, the rest of the back and wings spotted with white, the tail barred with rufous-white. The chin and throat are black, the upper breast rufescent, and the whole of the rest of the under surface white, barred with black. Example *c*, from the same locality, differs from the last in having the upper surface spotted indiscriminately with white and rufous, and the whole under surface rufous barred with black. The last individual, *d*, from Waigiou, has the upper surface spotted with rufous; the under parts rufous barred with black. The diagnostic points given by Salvadori—

"fœmina supra albo-maculata; gastræo albido .. *E. cyanocephala*."
"fœmina supra rufo-maculata; gastræo rufescente. *E. rufiventer*."

are thus inapplicable.

40. NESOCENTOR MENEBIKI (Garn.).

Nesocentor menebiki, Salvad. *op. cit.* vol. i. p. 377.

a. ♂. Mysol.

b. ♂. Samatee, Salwatti.

c. ♀. Dorei.

Iris red, in the Dorei bird yellow, with an outer ring of brown; bill yellowish, dark at the base; feet dark horn-colour. Length 65·5–66·4 centims., wing 20–23.

41. RHYTIDOCEROS PLICATUS (Penn.).

Rhytidoceros plicatus, Salvad. *op. cit.* vol. i. p. 392.

a. ♂. Momos, Waigiou.

b. ♀. Momos.

Iris of male orange, of female yellow; bill pale yellowish white, reddish at base; tarsus black. Length of male 90·5 centims., of female 78·5.

Both old birds, with the edges of the bill much notched. The male has six maxillary plaques; the female only four.

42. Alcyone lessoni, Cass.

Alcyone lessoni, Salvad. *op. cit.* vol. i. p. 410.

a. ♀. Batanta.

Iris brown; bill black; feet bright red-orange. Length 14·0 centims., wing 7·8.

A small specimen as compared with Salvadori's measurements, in which the length is given as 16·5–17·5 centims.

43. Alcyone pusilla (Temm.).

Alcyone pusilla, Salvad. *op. cit.* vol. i. p. 414.

a. ♂. Waigiou.
b. Batanta.

Iris brown; bill black; feet clear brown. Length of Batanta example 13 centims.

Salvadori does not mention Batanta as a locality for this bird.

44. Ceyx solitaria, Temm.

Ceyx solitaria, Salvad. *op. cit.* vol. i. p. 420.

a, b. ♂. Salwatti.
c, d. ♀. Salwatti.
e. ♀. Waigiou.

Iris brown; bill black; tarsus orange. Length 13·5–14 centims.; wing 5·4 centims.

This species has never previously been recorded from Waigiou.

45. Tanysiptera galatea, G. R. Gr.

Tanysiptera galatea, Salvad. *op. cit.* vol. i. p. 438.

a–c. ♂. Batanta.
d, e. ♂. Andai.
f, g. ♀. Andai.
h, i. ♂. Waigiou.
k, l. ♀. Waigiou.

Iris brown; bill brilliant coral-red; feet yellowish green.

Common; but difficult to obtain in good plumage.

46. Halcyon nigrocyanea, Wall.

Halcyon nigrocyanea, Salvad. *op. cit.* vol. i. p. 457.

Halcyon quadricolor, Oustal. Le Nat. 1880, p. 323; Sharpe, Birds of N. G. part 13.

a, b. ♂. Ansus, Jobi (*Bruijn*).
c. ♂. Ansus (*Bruijn*).

The series is interesting as proving the identity of *H. nigrocyanea*, and *H. quadricolor* of Oustalet. Example *a* is a typical individual of the former; *c* has the chestnut abdomen, and corresponds to the description and figure of the latter. It is noteworthy that in all other respects it agrees perfectly with *a*, though the colouring is somewhat brighter. The third, *b*, resembles *a*, but the blue abdomen shows a few scattered chestnut feathers, which are sufficient to make the identity of the two species evident. The skin is labelled ♂, which is most probably correct; and it would therefore seem most likely that *H. quadricolor* is a young stage of the male of *H. nigrocyanea*. It should be mentioned, however, that example *c* shows no sign of immaturity, and it is therefore quite possible that it may be a variety.

47. Sauropatis sauropHaga (Gould).

Sauropatis sauropHaga, Salvad. *op. cit.* vol. i. p. 468.

a–c. ♂. Mysol.
d. Jr. ♂. Mysol.
e. ♀. Mysol.
f. ♂. Waigiou.
g. ♀. Dorei.

Iris brown; bill as in *S. chloris*; feet brownish black. Length 28–29·8 centims.; wing 11·8–12·8 centims.

Individuals are of bluish or greenish shade, without reference to locality or sex. Example *d* has the beak and tail short, the breast delicately barred with brownish black, the wing barred with white. This species haunts the mangroves on the shores of most of the Papuan islands in abundance.

48. Sauropatis sancta (Vig. et Horsf.).

Sauropatis sancta, Salvad. *op. cit.* vol. i. p. 476.

a. ♀. Waigiou.
b. ♀. Batanta.

Iris brown; bill as in *S. chloris*; tarsus grey. Length 21 centims.

49. Syma torotoro, Less.

Syma torotoro, Salvad. *op. cit.* vol. i. p. 482.

a, b. ♂. Salwatti.
c. ♂. Waigiou.
d. ♀. Waigiou.
e. Jr. ♀. Waigiou.

Iris brown; bill and feet bright yellow. Length 21·5–22·4 centims.; wing 8·2 centims.

The immature female has a shading of brownish black on the vertex and a regular black collar. Bill and tail shorter; the former dusky yellow; otherwise resembles adult.

S. torotoro seems somewhat rare. It is found in the forest, not on the coast, and appears to feed entirely on insects.

50. Sauromarptis gaudichaudi (Q. et G.).

Sauromarptis gaudichaudi, Salvad. *op. cit.* vol. i. p. 487.

a–h. ♂. Waigiou.
i–n. ♀. Waigiou.
o–r. ♀. Batanta.
s. Jr. ♂. Batanta.
t–x. ♂. Mysol.
y, z. ♀. Mysol.
a′, b′. ♀. Aru.
c′. ♀. Salwatti.

Iris brown; bill greenish yellow; tarsus pale olive-green. Length 31·7–34 centims.; wing 13·5–14·5 centims.

In spite of Salvadori's opinion to the contrary, I cannot help regarding the blue-tailed bird as the male, and the chestnut tail as, in adult individuals, an invariable mark of the female sex. Salvadori holds that the females also assume the blue tails, but only in extreme adult life; and, secondly, that the male has at first a chestnut tail, but assumes the blue tail at an early stage.

The present series does not bear this first assertion out. Without a single exception all the adult examples with chestnut tails are marked ♀; all those with blue tails ♂. Among the former are some which are undoubtedly old birds, with the maxilla worn and notched at the edge, but the tails show no sign of turning blue. Again, in Salvadori's series of 98 individuals, of those labelled as ♀, with the tail blue, two only have Beccari's initial appended; the rest are birds obtained from Bruijn. Conversely, of those labelled ♂ with a chestnut tail, all are from Bruijn with the exception of two, which are of Beccari's collecting. I do not for a moment wish to imply that Mr. Bruijn's collectors are more unreliable than natives usually are, but I can only say that of my own hunters there was but one on whom I could depend for the accurate determination of sex.

The females have not the same deep glossy black back as the males, and the scapulars are in no case edged with blue. Example *s* is a young bird, with a very short beak and tail; the collar, eye-streak, loral spot, and sides of throat are fulvous; the blue on the wings is much paler; the tail beneath is red as in the female, but on the upper surface the basal half is strongly tinged with blue. It is a male. The bill is greenish black; basal half of mandible whitish.

51. Melidora macrorhina (Less.).

Melidora macrorhina, Salvad. *op. cit.* vol. i. p. 500.

a. ♂. Waigiou.
b. Jr. ♂. Waigiou.
c. ♀. Waigiou.
d. Jr. ♀. Dorei.

Iris brown; bill—maxilla very dark brown, mandible greenish yellow; feet greenish brown. Length of adult 33·7 centims.; of immature birds 27·0 and 29·5 centims.; wing 11·5 centims.

The immature examples have the whole under surface fulvous, becoming albescent on the abdomen. On the breast and throat each feather is edged with brownish black. Feathers of forehead and vertex tipped with dull green, surrounded by a dull cobalt line, with an ill-marked rufous collar posteriorly. The ochraceous edging of the feathers of the back and wings is devoid of any green tinge.

52. Eurystomus orientalis, Linn. (var. *pacificus*).

Eurystomus pacificus, Salvad. *op. cit.* vol. i. p. 503.
Eurystomus orientalis, Salvad. *op. cit.* vol. i. p. 508.

a. ♂. Jobi.
b. ♀. Jobi.
c. ♂. Batanta.
d. Andai.

53. Eurystomus crassirostris, Sclat.

Eurystomus crassirostris, Salvad. *op. cit.* vol. i. p. 510.

a. ♀. Efbe, Mysol.

Bill orange-red, tip black; tarsus and feet dull red. Length 33 centims., wing 20·2; tail 11·5; bill from gape 4·3, breadth 2·9; tarsus 1·9.

Easily distinguishable from *E. orientalis* by its brighter colouring and larger size.

54. Podargus papuensis, Q. et G.

Podargus papuensis, Salvad. *op. cit.* vol. i. p. 513.

a. ♂. Waigiou.
b. ♀. Waigiou.
c. ♀. Arfak.

Iris red-brown; bill and feet greyish brown. Length 56–57 centims.; wing 29·4–29·8 centims.

The male is much whiter beneath, and without the ruddy tinge which is apparent on the scapulars of the female.

55. Podargus ocellatus, Q. et G.

Podargus ocellatus, Salvad. *op. cit.* vol. i. p. 517.

a. ♂. Waigiou.
b. ♀. Mysol.
c. ♀. Ansus, Jobi.
d (♂). Arfak.
e. ♀. Arfak.
f. Pullus. Andai.

Iris brown; bill brownish; feet flesh-coloured. Length 32·5–33·8 centims.; wing 18–19 centims.

The nestling is a little ball of white fluff; the feathers of the upper surface faintly barred with brown, and with the centre of the apical portion of each feather brownish black.

56. ÆGOTHELES ALBERTISI, Sclat.

Ægotheles albertisii, Salvad. *op. cit.* vol. i. p. 524.

a. ♀. Arfak (*Bruijn*).

Salvadori considers it possible that this species may be identical with *Æ. wallacei.* Compared, however, with a female of the latter species, the present example is seen to differ by the much greater delicacy of the feet, tarsus, and beak. The maxilla has a finer and sharper hook, and the nostrils are smaller, and considerably more covered by the frontal plumes than is the case in *Æ. wallacei.* The tarsus also is longer, and the toe shorter than in the latter.

57. ÆGOTHELES WALLACEI (G. R. Gr.).

Ægotheles wallacei, Salvad. *op. cit.* vol. i. p. 526.

a. ♀. Arfak.

Obtained from Mr. Bruijn of Ternate. It corresponds with the description of *Æ. wallacei* given by Salvadori, except that a tolerably distinct line of rufous extends down the centre of the under surface from the chin to the abdomen.

58. MACROPTERYX MYSTACEA (Less.).

Macropteryx mystacea, Salvad. *op. cit.* vol. i. p. 537.

a. ♀. Batanta.

b. ♀. Chabrol Bay, Waigiou.

Iris brown; bill black; feet greyish black. Length 31·0–33·2 centims.; wing 22·5–23·5 centims.

Tolerably abundant on the sea-coast of all the islands of the N.W. part of New Guinea.

59. COLLOCALIA ESCULENTA (Linn.).

Collocallia esculenta, Salvad. *op. cit.* vol. i. p. 540.

a. ♂. Efbe, Mysol.

b. ♀. Efbe.

Iris brown; bill black; feet clear brown, claws black. Length 9·6 centims.; wing 10 centims.

60. PELTOPS BLAINVILLEI (Less. et Garn.).

Peltops blainvillei, Salvad. *op. cit.* vol. ii. p. 8.

a, b. ♂. Momos, Waigiou.

c. ♂. Mysol.

d. ♀. Andai.

e. Arfak.

Iris red, surrounded by a faint ring of lavender; bill and feet black. Length 18·5 centims. (Andai) to 20·5 centims. (Mysol). Wing 9·8–10·2 centims.

The Andai and Arfak examples differ in having the white dorsal spot much larger than in the others. In the Arfak bird some of the white feathers of this region are marked with red.

61. MONARCHA FRATER, Sclat.

Monarcha frater, Salvad. *op. cit.* vol. ii. p. 17.

a. Arfak.

62. MONARCHA GUTTULATUS (Garn.).

Monarcha guttulatus, Salvad. *op. cit.* vol. ii. p. 22.

a. ♂. Waigiou.
b. (Locality unknown.)
c. *Jr.* Waigiou.

Iris dark brown; bill slate-blue, light at the edges; feet ashy. Length about 17 centims., wing 8.

In *b* the forehead and throat are ashy, while the breast is washed with pale rufous. It is probably an immature male. Example *c* has the whole under surface white, the breast washed with rufous, and a few feathers on the chin greyish. Cheeks and lores buffish white; wings brown; external rectrices tipped with white.

63. MONARCHA CHALYBEOCEPHALUS (Garn.).

Monarcha chalybeocephalus, Salvad. *op. cit.* vol. ii. p. 30.

a, b. ♂. Waigiou.
c. ♂. Waigiou.
d. ♂. Mysol.

Iris ruddy; bill slate-coloured; tarsus greyish black. Length 18 centims., wing 8·6–9·2. The species does not seem to have been recorded before from Mysol.

64. MONARCHA MELANONOTUS, Sclat.

Monarcha melanonotus, Salvad. *op. cit.* vol. ii. p. 38.

a, b. ♂. Mysol.
c. ♀. Mysol.
d. ♂. N. coast of Papua, long. 139° (*Bruijn*).

Iris brown; bill blue-black; feet bluish black. Length 14·5–15·8 centims., wing 7·4–7·6. In the male obtained from Mr. Bruijn the yellow of the uropygium is of less extent than in the others.

65. ARSES BATANTÆ, Sharpe.

Arses batantæ, Salvad. *op. cit.* vol. ii. p. 42.

a–c. ♂. Batanta.
d–g. ♀. Batanta.
h. ♀. Waigiou (*Bruijn*).

Iris brown; bill and tarsus dark cobalt-blue. Length 18·5–19·3 centims.; wing 8·5–8·6, male 9·0. The eyelid is bright cobalt-blue, not yellow as Mr. Sharpe has described it. The Waigiou bird is marked ♂, but is no doubt a female, unless the young male in the first stage has the plumage of the female. In this example the fulvous of the breast ends abruptly, not shading off into the white of the abdomen, as is the case in the others.

66. Arses insularis (Meyer).

Arses insularis, Salvad. *op. cit.* vol. ii. p. 47.

a. ♂. Jobi (*Bruijn*).

67. Sauloprocta melaleuca (Q. et G.).

Sauloprocta melaleuca, Salvad. *op. cit.* vol. ii. p. 48.
Rhipidura tricolor, Sharpe, Cat. B. vol. iv. p. 339.

a. ♂. Momos, Waigiou.
b. ♀. Momos, Waigiou.
c. ♀. Samatee, Salwatti.
d. Dorei.
e. ♀. Batanta.
f. ♂. Dobbo, Aru.

Iris brown; bill and feet black. Length 21·5–23·0 centims., wing 10·1–10·6.

68. Rhipidura setosa (Q. et G.).

Rhipidura setosa, Salvad. *op. cit.* vol. ii. p. 61.

a. ♂. Momos, Waigiou.
b. ♀. Chabrol Bay, Waigiou.
c. Momos.

Iris brown; tarsus dark grey; bill black. Length 17·0–17·7 centims., wing 8·0–9·5.

69. Muscicapa griseosticta (Swinh.).

Muscicapa griseosticta, Salvad. *op. cit.* vol. ii. p. 80.

a. ♀. Momos, Waigiou, Oct. 20.
b. Efbe, Mysol, Dec. 8.

Iris brown; bill and feet black. Length 13·3 centims., wing 8·6. The above localities are both new for this species.

70. Monachella mulleriana, Schl.

Monachella saxicolina, Salvad. *op. cit.* vol. ii. p. 83.

a. ♂. Arfak.
b. Arfak.

71. Pœcilodryas hypoleuca (G. R. Gr.).

Pœcilodryas hypoleuca, Salvad. *op. cit.* vol. ii. p. 86.

a. ♂. Salwatti.
b. Waigiou.

Iris brown; bill black; tarsus brown. In both individuals the black patches of the sides of the breast nearly, if not actually, meet in the middle line. Salwatti is a new locality for this species.

72. Micrœca flavovirescens, G. R. Gr.

Micrœca flavovirescens, Salvad. *op. cit.* vol. ii. p. 92.

a. ♂. Ansus, Jobi.

Iris brown; maxilla black, mandible flesh-colour; feet and tarsus flesh-colour. Length 15·8 centims., wing 7·8.

73. Machærorhynchus albifrons, G. R. Gr.

Machærorhynchus albifrons, Salvad. *op. cit.* vol. ii. p. 109.

a. ♂. Arfak.

Like *M. nigripectus,* this species has the long loose feathers of the back strongly tipped with yellow.

74. Machærorhynchus nigripectus, Schleg.

Machærorhynchus nigripectus, Salvad. *op. cit.* vol. ii. p. 109.

a, b. ♂. Arfak.

75. Malurus alboscapulatus, Meyer.

Malurus alboscapulatus, Salvad. *op. cit.* vol. ii. p. 119.

a. ♂. Arfak.

76. Graucalus cæruleogriseus (G. R. Gr.).

Graucalus cæruleogriseus, Salvad. *op. cit.* vol. ii. p. 122.

a. ♀. Mansinam.
b. ♀. Dorei.
c. ♀. Arfak.

Iris brown; bill and feet black. Length about 34·0 centims., wing 16·0–16·6. The Mansinam example differs from the others in having the apices of all the flight-feathers edged with white. All the tail-feathers are also strongly tipped with white, the outer pair for half an inch or more. In the Arfak bird there are no white tips to the wing-feathers, and only a faint trace of that colour at the apices of the two external rectrices, and the under wing-coverts are a deeper isabelline. All three examples are darker on the under surface than are those in the British Museum from the Aru Islands.

77. Graucalus boyeri (G. R. Gr.).

Graucalus boyeri, Salvad. *op. cit.* vol. ii. p. 124.

a. ♀. Mysol.

Iris dark brown; bill and feet black. Length 24·5 centims., wing 12·8.

Lores white, nasal plumes buffish; no black on chin, the first two or three feathers of which are pale buff. The external pair of rectrices are faintly tipped with grey.

78. Graucalus magnirostris, Forsten.

Graucalus magnirostris, Salvad. *op. cit.* vol. ii. p. 129.

a. ♂. Waigiou.

Iris dark brown; bill and feet black. Wing 17·2 centims., tail 16·0, bill 3·2, tarsus 2·7. This species has hitherto been considered as peculiar to the Halmaheira group, but a comparison of the present example with individuals from that island and Batchian shows that they are identical.

79. Graucalus melanops (Lath.).

Graucalus melanops, Salvad. *op. cit.* vol. ii. p. 130.

a (♀). Mysol.
b. ♀. Efbe, Mysol.

Iris brown; bill black; feet brownish black. Length 32·3 centims., wing 19·0.

Chin, throat, and forehead irregularly marked with grey and black in both examples. In *a* the breast and upper part of the abdomen are grey, with obsolete bars. In *b* the upper breast only is grey, with faint barring; the white of the under surface being more extended than in *a*. *G. melanops* has not previously been recorded from any of the islands of N.W. New Guinea, although it was obtained by Wallace as far north as Amboina. A comparison of the present specimens with others from the Aru Islands shows no differences of importance.

80. Graucalus papuensis (Gm.).

Graucalus papuensis, Salvad. *op. cit.* vol. ii. p. 132.

a, b. ♂. Mysol.
c. ♀. Mysol.
d. ♂. Salwatti.
e. ♀? Jobi (*Bruijn*).

Iris brown; bill black; tarsus brownish black. Length 28·6–30·2 centims., wing 14·5–15·3.

If the label of the bird obtained from Mr. Bruijn be correct, Jobi is apparently new as a locality for this species. It does not differ from the others. The sex is given as ♀, but no doubt erroneously, as the forehead and lores are jet-black.

81. Edoliisoma melan (S. Müll.).

Edoliisoma melas, Salvad. *op. cit.* vol. ii. p. 143.

a. ♀. Chabrol Bay, Waigiou.
b. ♀. Ansus, Jobi.

Iris brown; bill black; tarsus dark slate. Length 24·0–24·6 centims., wing 12·0. The example from Waigiou, a new locality for this species, is darker than the Jobi bird.

82. Edoliisoma montanum (Meyer).

Edoliisoma montanum, Salvad. *op. cit.* vol. ii. p. 147.

a. ♂. Arfak (*Bruijn*).

83. Edoliisoma schisticeps (G. R. Gr.).

Edoliisoma schisticeps, Salvad. *op. cit.* vol. ii. p. 148.

a. ♀. Mysol.

Length 21·5 centims., wing 10·7. The dull smoky grey of the head ill defined posteriorly, and shading into the dark cinnamon of the cervical region.

84. Edoliisoma incertum (Meyer).

Edoliisoma incertum, Salvad. *op. cit.* vol. ii. p. 152.

a. ♀. Jobi (*Bruijn*).

With no black on the chin, and with the median rectrices with a very small spot of that colour.

85. Lalage atrovirens (G. R. Gr.).

Lalage atrovirens, Salvad. *op. cit.* vol. ii. p. 159.

a. ♀ (?). Arfak (*Bruijn*).

This is probably a young male, not a female, the upper surface being shining greenish-blue. The species has hitherto only been recorded from Mysol, Salwatti, and the adjacent coast.

86. Artamus leucogaster (Valenc.).

Artamus leucogaster, Salvad. *op. cit.* vol. ii. p. 167.

a. ♂. Waigiou, Nov. 11.

Iris dark brown; bill greyish blue; feet slate-colour. But rarely seen in the Papuan islands during the cruise of the 'Marchesa.'

87. Artamus maximus, Meyer.

Artamus maximus, Salvad. *op. cit.* vol. ii. p. 172.

a–d. Arfak.

e. ♂. Arfak (*Bruijn*), January.

a–d without label, obtained by the hunters in the neighbourhood of Hattam.

88. Chibia carbonaria (S. Müll.).

Dicruropsis carbonaria, Salvad. *op. cit.* vol. ii. p. 177.

a, b. ♂. Dorei.

c. ♂. Chabrol Bay, Waigiou.

d, e. Momos, Waigiou.

f. Efbe, Mysol.

g. ♀. Batanta.

Iris crimson; bill and feet black. Length 31·0–32·7 centims.; wing 15·2–16·5 centims. The Batanta example is much smaller than the others, and is of a deeper blue-black on the breast and back. The spots are brighter, and there is a tendency to the development of a side neck-hackle.

89. Cracticus cassicus (Bodd.).

Cracticus cassicus, Salvad. *op. cit.* vol. ii. p. 184.

a. ♂. Dorei.

b. Arfak.

c. ♂. Waigiou.

d. Samatee, Salwatti.

e. ♀. E. Batanta.

f. ♀. Dobbo, Aru.

Iris dark brown, except in the Batanta bird, in which it was orange; bill slate-blue, dark at the tip; tarsus black. Length 33·4–

36·9 centims. (Batanta); wing 16·5–17·0 centims. *b* is an individual in imperfect plumage; the whole of the upper surface, with the exception of the uropygial region, black; the under surface dusky. It was brought down by the hunters from the Arfak, but I have no record as to its exact locality.

90. CRACTICUS QUOYI (Less.).

Cracticus quoyi, Salvad. *op. cit.* vol. ii. p. 190.

a. ♂. Salwatti.
b. ♀. Salwatti.
c, d. ♂. Mysol.
e. ♀. Mysol.
f. ♂. Chabrol Bay, Waigiou.
g. ♀. Dobbo, Aru.

Iris brown; bill slate-blue, apical half black; tarsus and feet brownish black. Length 35·4–38·1 centims.; wing 17·0–18·8 centims. As in *C. cassicus*, the size of the bill is subject to great variation.

91. RHECTES UROPYGIALIS, G. R. Gr.

Rhectes uropygialis, Salvad. *op. cit.* vol. ii. p. 193.

a, b. ♂. Mysol.
c, d. ♀. Mysol.
e. ♂. Salwatti.

Iris brown; bill and feet black. Length 26·0–28·8 centims.; wing 12·0–12·6 centims. The females have the head a duller black than the males, and the forehead and lores are dull brown. The cinnamon of the back and under surface is paler.

92. RHECTES ARUENSIS, Sharpe.

Rhectes aruensis, Salvad. *op. cit.* vol. ii. p. 194.

a. Jr.? Wanumbai, Aru.

Chin and throat fuscous; wings and tail brownish black; uropygium and upper tail-coverts brown. Under surface fulvous.

93. RHECTES DICHROUS, Bp.

Rhectes dichrous, Salvad. *op. cit.* vol. ii. p. 195.

a. ♂. N. coast of Papua, long. 139° E. (*Bruijn*).

94. RHECTES CERVINIVENTRIS, G. R. Gr.

Rhectes cerviniventris, Salvad. *op. cit.* vol. ii. p. 200.

a. Arfak (?) (*Bruijn*).
b. Locality unknown.

Example *a* agrees with those in the British Museum. It is labelled "Arfak," but most probably erroneously. *b* is without label, and differs considerably from the other, though it is possible that these differences are only sexual. There is an entire absence of the hoary appearance of the head and upper part of the back noticeable in the other skin; the wings have no tinge of rufous;

the chin and throat are darker, with an ill-marked narrow rufous band below; the rest of the under surface is buff.

95. Rhectes jobiensis, Meyer.

Rhectes jobiensis, Salvad. *op. cit.* vol. ii. p. 201.

a. ♂. Ansus, Jobi.

b. ♀. "Mount Arfak" (?) (*Bruijn*).

Iris brown; bill light fleshy horn; feet greyish brown. Length 27·6 centims.; wing 12·0 centims.

The second example is probably another instance of erroneous locality. It does not differ in any way from the Ansus bird.

96. Rhectes ferrugineus, S. Müll.

Rhectes ferrugineus, Salvad. *op. cit.* vol. ii. p. 203.

a. ♀. Andai.

Iris chocolate-brown; bill black; feet slate-colour. Length 29·0 centims.; wing 14·2 centims.

The loose feathers of the lower part of the back are strongly tipped with fulvous.

97. Rhectes leucorhynchus, G. R. Gr.

Rhectes leucorhynchus, Salvad. *op. cit.* vol. ii. p. 206.

a. ♂. Momos, Waigiou.

b. ♀. Momos.

c. Pullus. Waigiou.

Iris pale yellow; bill pale yellowish; feet light grey. Length 30·5 centims., wing 13·5–14·5. The male has the ear-coverts more rufous than the female. The young bird resembles the adult, but is browner.

98. Colluricincla megarhyncha (Q. et G.).

Colluricincla megarhyncha, Salvad. *op. cit.* vol. ii. p. 211.

a. ♂. Batanta.

b, *c.* ♀. Batanta.

d. Batanta.

Iris brown; bill dull purplish grey; feet greyish. Length 19·1–20·5 centims., wing 9·0–9·5.

99. Colluricincla affinis (G. R. Gr.).

Colluricincla affinis, Salvad. *op. cit.* vol. ii. p. 213.

a. ♂. Momos, Waigiou.

b. ♂. Waigiou.

Iris grey-brown; bill horn-colour; feet brownish black. Length 18·5 centims., wing 9·1–9·3.

A smaller species than the preceding, and without the rufous on the under surface.

100. Pachycephala soror, Sclat.

Pachycephala soror, Salvad. *op. cit.* vol. ii. p. 222.

a. ♀. Arfak.

101. Pachycephala schlegeli, Rosenb.

Pachycephala schlegelii, Salvad. *op. cit.* vol. ii. p. 223.

a–d. ♂. Arfak.
e. ♀. Arfak.

102. Pachycephala rufinucha, Sclat.

Pachycephala (?) *rufinucha*, Salvad. *op. cit.* vol. ii. p. 225.

a. Arfak.

103. Pachycephalopsis hattamensis (Meyer).

Pachycephalopsis hattamensis, Salvad. *op. cit.* vol. ii. p. 236.

a. Arfak.

104. Pachycare flavogrisea (Meyer).

Pachycare flavogrisea, Salvad. *op. cit.* vol. ii. p. 238.

a. ♂. Arfak (*Bruijn*).
b. Arfak.

105. Climacteris placens, Sclat.

Climacteris placens, Salvad. *op. cit.* vol. ii. p. 241.

a (♀). Arfak.

This example has the reddish cheeks which by Salvadori are said to be the characteristic of the female.

106. Sittella papuensis (Schleg.).

Sittella papuensis, Salvad. *op. cit.* vol. ii. p. 242.

a (♂). Arfak.

Bill in the dried skin yellow, black at apex; feet lemon-yellow. Wing 8·3 centims.

Entire head, chin, and throat white, eyelid bright yellow. Breast and abdomen fuscous, with well-marked dark striæ. Upper surface like the under, but less striated. Wings brown, the secondaries and tertiaries paler towards the tip. Lesser wing-coverts blackish, with a faint blue gloss; under wing-coverts the same, but with some of the greater series white at the tip. Upper tail-coverts white; under tail-coverts barred black and white, each feather being of four colours—ashy, fawn-colour, black, and white, from base to apex. Tail black; the three or four outer rectrices tipped with white.

This specimen is without the obsolete white spots on the breast, abdomen, and upper surface described by Salvadori, neither is there any trace of white marking on the inner web of the third, fourth, and fifth primaries[1].

107. Cinnyris jobiensis (Meyer).

Hermotimia jobiensis, Salvad. *op. cit.* vol. ii. p. 246.

a. ♂. Ansus, Jobi.
b. ♀. Ansus.

[1] In the above description Salvadori writes "rectricibus *tertia, quarta et quinta*" &c., but it is evident from the context that *remigibus* should be read.

Iris brown; bill and feet black. Length 10·9 centims.; wing 6·1, of female 5·1.

The male bird has a few greenish-yellow feathers on the breast, abdomen, and mantle.

108. Cinnyris aspasiæ, Less.

Hermotimia aspasia, Salvad. *op. cit.* vol. ii. p. 247.

a. ♂. Waigiou.
b. ♀. Waigiou.
c. ♂. "New Guinea."
d. ♂. Mysol.
? *e.* ♀. Aru.

Iris dark brown; bill and feet black. Length of Mysol male 11·7 centims., wing 6·1.

The Aru bird may perhaps be the female of *C. chlorocephala*.

109. Cinnyris frenatus (S. Müll.).

Cyrtostomus frenatus, Salvad. *op. cit.* vol. ii. p. 265.

a. ♂. Waigiou.
b. ♀. Waigiou.
c, d. ♂. Mysol.
e–h. ♀. Mysol.
i, k. ♂. Dorei.
l. ♂. Jobi.
m. ♂. Aru.

Iris brown; bill and feet black. Length 10·7–12·2 centims. The Jobi bird, which from the narrow yellow moustachial streak is evidently not quite adult, is considerably lighter in colour on the head, neck, and upper surface than the others.

110. Dicæum pectorale, Müll. et Schleg.

Dicæum pectorale, Salvad. *op. cit.* vol. ii. p. 273.

a. ♂. Napriboi, Waigiou.
b. ♂. Andai.
c. ♂. Arfak.

Iris brown; bill brownish black; feet dark greyish brown. Length 9·0–9·5 centims., wing 5·2.

111. Pristorhamphus versteri, Finsch.

Pristorhamphus versteri, Salvad. *op. cit.* vol. ii. p. 286.

a, b. ♂. Arfak.
c. ♀. Arfak (*Bruijn*).

The female corresponds with Salvadori's description of the female of *P. versteri*, but has no trace of white on the tail-feathers!

112. Oreocharis arfaki (Meyer).

Oreocharis arfaki, Salvad. *op. cit.* vol. ii. p. 289.

a, b (♂). Arfak.

In one example there is no trace of white in the middle of the breast and abdomen, these parts being much more strongly tinged with vinous brown than in the other specimen. The yellow apical spot on the external web of the wing-feathers is not confined to the three last tertiaries, but is found also on all the secondaries.

113. Myzomela nigrita, G. R. Gr.

Myzomela nigrita, Salvad. *op. cit.* vol. ii. p. 291.

a. ♂. Dobbo, Aru.

Iris brown; bill and feet black. Length about 11·5 centims., wing 5·7.

114. Myzomela rosenbergi, Schleg.

Myzomela rosenbergii, Salvad. *op. cit.* vol. ii. p. 294.

a. ♂. Arfak (*Bruijn*).
b. ♀ (?). Arfak (*Bruijn*).
c. Jr. ♂ (?). Arfak (*Bruijn*).
d. Jr. ♀ (?). Arfak (*Bruijn*).

This series, if the sex be in each case rightly given, would confirm Meyer's assertion that the adult male and female are alike in plumage. Examples *a* and *b* do not differ except that the latter is less bright in colouring; *c* resembles Salvadori's description of an adult female, and *d* that of the young bird, the latter being without the red uropygium. It is, however, most probable that the sex has been wrongly determined by Mr. Bruijn's hunters in at least two out of the four individuals.

115. Myzomela adolphinæ, Salvad.

Myzomela adolphinæ, Salvad. *op. cit.* vol. ii. p. 299.

a. ♂. Arfak.

116. Myzomela erythrocephala, Gould.

Myzomela erythrocephala, Salvad. *op. cit.* vol. ii. p. 500.

a, b. ♀. Dobbo, Aru.

Iris brown; bill black; tarsus brown. Length 10·8–11·0 centims., wing 5·0–5·2.

117. Myzomela eques (Less.).

Myzomela eques, Salvad. *op. cit.* vol. ii. p. 301.

a. ♂. Mysol.

Bill black; tarsus blackish brown. Length 16·2 centims. (Salvadori gives 11·5–14·0 centims.!); wing 6·9.

118. Myzomela obscura, Gould.

Myzomela obscura, Salvad. *op. cit.* vol. ii. p. 303.

a. ♂. Wammar, Aru.

Iris brown; bill black; tarsus grey. Length 15·1 centims., wing 7·0.

With no trace of vinaceous on the head.

119. GLYCIPHILA MODESTA, G. R. Gr.

Glyciphila modesta, Salvad. *op. cit.* vol. ii. p. 307.

a. ♀. Dobbo, Aru.

Iris brown; bill and feet clear brown. Length 11·5 centims., wing 6·5.

120. MELILESTES MEGARHYNCHUS (G. R. Gr.).

Melilestes megarhynchus, Salvad. *op. cit.* vol. ii. p. 313.

a. ♂. Momos, Waigiou.

Iris red; bill black; feet lead-colour. Length 25·0 centims., wing 9·9.

121. MELILESTES NOVÆ GUINEÆ (Less.).

Melilestes novæ guineæ, Salvad. *op. cit.* vol. ii. p. 315.

a. Waigiou.

Iris brown; bill and tarsus black.

122. MELIPOTES GYMNOPS, Sclat.

Melipotes gymnops, Salvad. *op. cit.* vol. ii. p. 317.

a, b. Arfak.

123. MELIDECTES TORQUATUS, Sclat.

Melidectes torquatus, Salvad. *op. cit.* vol. ii. p. 319.

a. ♂. Arfak (*Bruijn*).

Anterior part of the cheeks rufous. Below the black pre-pectoral collar is another of light fawn colour.

124. MELIRROPHETES LEUCOSTEPHES, Meyer.

Melirrophetes leucostephes, Salvad. *op. cit.* vol. ii. p. 320.

a. Arfak.

Apparently not adult, the feathers of the back with ochraceous margins; caruncle small.

125. PTILOTIS ANALOGA, Rchb.

Ptilotis analoga, Salvad. *op. cit.* vol. ii. p. 327.

a. ♂. Momos, Waigiou. (Length 17·2 centims., wing 7·9.)

b. ♀. Momos. (Length 18·5 centims., wing 8·8.)

Iris brown; bill brownish black; tarsus grey. Example *a* is considerably smaller than *b*; the auricular tufts are shorter and whitish, and the feathers of the side of the uropygium are not tipped with white as in *b*.

126. PTILOTIS SONOROIDES, G. R. Gr.

Ptilotis sonoroides, Salvad. *op. cit.* vol. ii. p. 335.

a. ♂. Mysol.

b. ♀. Mysol.

Iris brown; bill black; feet grey. Length 26·0 centims., wing 10·3–11·2.

127. Ptilotis cinerea, Sclat.

Ptilotis cinerea, Salvad. *op. cit.* vol. ii. p. 338.

a. Arfak.

Under wing-coverts ashy, posteriorly rufous.

128. Ptilotis chrysotis, Less.

Xanthotis chrysotis, Salvad. *op. cit.* vol. ii. p. 346.

a. ♂. Salwatti.

Iris brown; bill and feet black. Length 23·0 centims., wing 10·5.

This species is not found in Waigiou and Batanta, where it is replaced by *P. fusciventris*. Dr. Gadow (Cat. B. vol. ix. p. 238), although admitting the latter as a subspecies, has placed the example under *P. chrysotis*, and erroneously given Waigiou as a habitat.

129. Ptilotis fusciventris (Salvad.).

Ptilotis fusciventris, Salvad. *op. cit.* vol. ii. p. 348.

a, b. ♂. Waigiou.

c. ♀. Momos, Waigiou.

Iris brown; bill black; feet bluish grey. Length 23·7 centims., wing 10·5–10·9.

Differs from the preceding species in being greener on the upper surface, and without the rufous on the breast and sides of the body.

130. ? Euthyrhynchus griseigularis, Schleg.

Euthyrhynchus griseigula, Salvad. *op. cit.* vol. ii. p. 341.

Euthyrhynchus flavigula, *id. ibid.* p. 341.

a. ♂. Andai.

Iris gamboge-yellow; bill horn-colour, lower mandible yellowish; feet bluish slate. Length 19·8 centims., wing 9·4.

Above uniform olive, vertex and occiput dark brown; beneath dull rufescent, faintly washed with olive-yellow. Inner web of remiges whitish, not rufescent.

In the absence of any specimen with which to compare the present example, I am uncertain to what species it should be referred. *E. flavigula* comes from the same locality as *E. griseigula*, is "very like *E. griseigula*, but smaller, and with the rufescent underparts slightly washed with olive." Possibly the two species are not really separable. Salvadori's measurements (17·5 and 16·0 centims.) are probably given from the dried skin.

131. Tropidorhynchus novæ guineæ.

Tropidorhynchus novæ guineæ, Salvad. *op. cit.* vol. ii. p. 357.

a. ♂. Wokan, Aru.

b. ♂. Dobbo, Aru.

c. ♀ *juv.* Dobbo.

d. ♂. Waigiou.

e. ♂. Batanta.

Iris brown; in the Waigiou example red. Bill and feet black. Length 35–37 centims. The young bird is without frontal tubercle, and in addition to the olive tinge on the wing, and the white and yellowish-white edged feathers of the back and side of the throat mentioned by Salvadori, there is a very conspicuous white nuchal collar. The feathers of the head and throat are not lanceolate as in the adult, and the chin is brownish black. The feathers of the rump are rusty brown.

132. ZOSTEROPS NOVÆ GUINEÆ, Salvad.

Zosterops novæ guineæ, Salvad. *op. cit.* vol. ii. p. 367.

a. ♂. Arfak (*Bruijn*).

133. PITTA NOVÆ GUINEÆ, Müll. et Schleg.

Pitta novæ guineæ, Salvad. *op. cit.* vol. ii. p. 380.

a, b. ♂. Andai.
c, d. ♂. Mysol.
e. ♂. Salwatti.
f. ♀. Salwatti.
g. ♂. Dorei.
h. ♀. Batanta.

Iris brown; bill black; feet pinkish brown. Length 17·0–19·4 centims., wing 10·1–10·7.

The white patch on the primaries is extremely irregular: in some cases it is to be found on one side and not on the other.

This species never seemed very abundant, and, like others of the same genus, examples were most difficult to shoot owing to their shyness.

134. PITTA MACKLOTI, Temm.

Pitta mackloti, Salvad. *op. cit.* vol. ii. p. 395.

a. ♂. Salwatti.
b. ♀. Salwatti.
c. ♂. Waigiou.
d. ♀. Waigiou.
e, f. ♀. Batanta.
g. ♂. N. New Guinea, long. 139° E. (*Bruijn*).
h. ♂. Andai.
i–m. ♂. Mysol.
n. *Jr*. ♂. Mysol.
o, p. ♀. Mysol.

Iris brown; bill black; tarsus pinkish slate. Length 18·0–21·5 centims., wing 10·0–10·9. Salwatti birds largest. No constant differences between island and island.

135. POMATORHINUS ISIDORII, Less.

Pomatorhinus isidori, Salvad. *op. cit.* vol. ii. p. 409.

a, b. ♂. Andai.
c. ♀. Efbe, Mysol.

Iris yellow-brown; bill yellow, base of upper mandible horn; tarsus blackish. Length 25·8–26·7 centims., of female 23·0; wing 11·6–11·8.

136. Eupetes cærulescens, Temm.

Eupetes cærulescens, Salvad. *op. cit.* vol. ii. p. 412.

a. ♂. Andai.

137. Calobates melanope (Pallas).

Calobates melanope, Salvad. *op. cit.* vol. ii. p. 431.

a. ♂. Waigiou.
b. ♀. Waigiou.
c. Momos, Waigiou.

Iris brown; bill brown; tarsus yellowish brown. Length 18·7–18·8 centims., wing 8·0–8·2.

This species has not previously been obtained from Waigiou, though it was met with by Meyer on the Arfak range. The present examples were shot from the 22nd–29th October, on the south side of the island of Waigiou.

138. Calornis metallica (Temm.).

Calornis metallica, Salvad. *op. cit.* vol. ii. p. 447.

a–d. ♂. Mysol. (Length 22·0–25·4 centims.)
e, f. ♀. Mysol. (Length 22·2–23·1 centims.)
g. Efbe, Mysol. (Length 25·4 centims.)
h. ♂. Samatee, Salwatti. (Length 24·2 centims.)
i, k. ♂. Dobbo, Aru. (Length 25·3–26·2 centims.)
l. ♀. Wammar, Aru. (Length 26·2 centims.)
m. ♂ *jr.* Wammar, Aru. (Length 23·6 centims.).

Iris bright orange-red; bill and feet black. Length 22·0–26·2 centims.; the dimensions of the Aru bird the largest, though this seems chiefly dependent on the greater length of the tail; wing 10·8–11·3. The Mysol are more brilliant than the Aru birds. The young bird from the latter locality has the upper surface as in the adult; the whole under surface is white, with a few metallic feathers on the breast; the feathers of the throat with black shafts.

139. Calornis cantoroides, G. R. Gr.

Calornis cantoroides, Salvad. *op. cit.* vol. ii. p. 456.

a. ♂. Mysol.
b–d. ♀. Mysol.
e, f. ♂. Samatee, Salwatti.
g. ♀. Samatee.

Iris bright orange-red, with an outer ring of yellow; bill and feet black. Length 21·0–23·7 centims., wing 9·7–10·5.

140. Melanopyrrhus anais (Less.).

Melanopyrrhus anais, Salvad. *op. cit.* vol. ii. p. 461.

a. ♂. Salwatti.

Iris yellow; bill and tarsus pale yellow. Length about 25·0 centims., wing 13·9.

141. Melanopyrrhus orientalis (Schleg.).

Melanopyrrhus orientalis, Salvad. *op. cit.* vol. ii. p. 463.

a. Arfak (*Bruijn*).

This species, as far as I am aware, has not as yet been recorded from the Arfak Mountains, but it is possible that the locality may be erroneous, as has apparently been the case in several instances of birds collected by Mr. Bruijn's hunters. The present example has a broad occipital black bar.

142. Mino dumonti, Less.

Mino dumonti, Salvad. *op. cit.* vol. ii. p. 466.

a–d. ♂. Waigiou.
e. ♀. Waigiou.
f. ♀. Batanta.
g, h. ♂. Dorei Bay.
i. ♀. Dorei Bay.
k, l. ♂. Aru.

Iris pale yellow; bill and tarsus orange; papillæ round eye orange. Length 27·5–29·0 centims., wing 14·2–15·2 (of the Batanta bird 13·8 centims.). The development of the papillæ varies considerably. In one male from Waigiou they are very large, and the intervening space on the vertex is only 0·4 centims. in breadth. This is the first recorded instance of the occurrence of this species in Batanta. The example does not differ from the rest of the series except in having the yellow of the abdomen more extended in area.

143. Mimeta striatus (Q. et G.).

Mimeta striata, Salvad. *op. cit.* vol. ii. p. 473.

a. ♀. Batanta.

Iris dull red; bill red-brown; feet dull grey. Length 30·2 centims., wing 14·3.

144. Corvus orru, Müll.

Corvus orru, Salvad. *op. cit.* vol. ii. p. 483.

a. ♂. Momos, Waigiou. (Iris pearly grey.)
b. ♀. Neosmapi I., Dorei Bay. (Iris sky-blue.)
c. ♀. Mysol.
d. ♀. Samatee, Salwatti. (Iris brown.)

Colour of iris variable, all the above examples being apparently adult. Bill and tarsus black. Length 46·4–49·1 centims., wing 30·0–34·7.

145. Gymnocorax senex (Less.).

Gymnocorax senex, Salvad. *op. cit.* vol. ii. p. 490.

a. ♀. Jobi (*Bruijn*).

Both Beccari and D'Albertis describe this species as being very common, which is certainly contrary to my experience as far as regards N.W. New Guinea.

146. Manucodia chalybeata, Penn.

Manucodia chalybeata, Salvad. *op. cit.* vol. ii. p. 498.

a. ♂. Mysol.

Iris red; bill and feet black. Length 39·0 centims., wing 19·0, tail 16·5, bill from gape 4·8.

Salvadori separates *M. chalybeata* from *M. atra* by the wavy feathers of the upper back and by the black velvety band at the apex of each feather of that part and the under surface, which characteristics he states to be constant at all ages. The feathers of the anterior part of the neck are, he considers, broader and more golden, and the measurements somewhat smaller.

The present example is evidently an old male, and is in splendid plumage. It corresponds to Salvadori's description of *M. chalybeata* in every way, and I have accordingly placed it under this designation, as I have only twenty-four individuals of this and the allied species, as against a series of nearly five times that number catalogued in the 'Ornitologia della Papuasia.' At the same time I am strongly inclined to regard the two species as identical. The black velvety bands on the feathers of the breast and back are, I think, a characteristic of not much value, since Salvadori himself describes them as "in very old individuals *extending* on to the uropygium," thereby admitting that age can produce them in feathers in which they were not previously apparent. With regard to dimensions, the present example slightly *exceeded* the average of twenty *M. atra*, and the beak was considerably larger, so that size as a diagnostic point is of no value. With regard to the plumage of *M. atra* no constancy is apparent; all colours between oily green and deep violet or purple being observable, while in some the wrinkled plumes of the breast are beginning to appear.

It seems improbable that there should be two such closely allied, yet distinct species coexisting in the same districts; and I should therefore be inclined to consider *M. chalybeata* as an older stage of *M. atra*.

147. Manucodia jobiensis, Salvad.

Manucodia jobiensis, Salvad. *op. cit.* vol. ii. p. 502.

a. ♂. Near Ansus, Jobi; November 11th.

Iris red; bill and feet black. Length 33·5 centims., wing 17·5, tail 15·0, bill from gape 3·8, tarsus 3·4.

The above measurements are considerably less than those given by Salvadori.

This Manucode, which is easily recognizable as a distinct species, was apparently uncommon in Jobi.

148. Manucodia atra (Less.).

Manucodia atra, Salvad. *op. cit.* vol. ii. p. 504.

a. ♂. Mysol.
b, c. ♀. Mysol.
d–m. ♂. Waigiou.

p–t. ♀. Waigiou.
u. ♀. Dorei.
v. Patr. incert.

Iris brilliant red, dull orange in the female; bill and feet black. Length 33·0–42·1 centims., the female always smaller than the male; wing 17·0–18·7, tail 16·0–18·5, bill from gape 3·6–4·6.

This species was very abundant in Waigiou.

149. PAROTIA SEXPENNIS (Bodd.).

Parotia sexpennis, Salvad. *op. cit.* vol. ii. p. 515.

a–f. ♂. Arfak.
g. Juv. ♂. Arfak.
h–k. ♀. Arfak.
l–y. ♂. Arfak (*Bruijn*).
z–b'. ♀. Arfak (*Bruijn*).
c', d'. Jr. ♂. Arfak (*Bruijn*).

Iris blue, with a narrow external ring of yellow; bill and feet black. Wing 16·0 centims. Arfak name *Kurangan.*

The young males much resemble the females, but the latter seem to be somewhat smaller and to have shorter wings, while the inner webs of the primaries are bordered with rufous-brown, which does not appear to be the case with the immature males; the light eyebrow seems also more distinct. But it must be admitted that the sexes in the above series may very possibly have been wrongly identified.

In the male bird the patch of metallic silver on the head forms when at rest a triangle with the apex forward, but in some skins these feathers are seen standing erect, or even depressed over the nostrils. Immediately above is a small osseous tuberosity, which doubtless gives origin to some muscular fibres whose other ends are attached to the bases of the above-mentioned plumes, which can be erected at will. This tuberosity appears, as might be expected, not so well marked in the female.

150. LOPHORHINA SUPERBA (Penn.).

Lophorhina superba, Salvad. *op. cit.* vol. ii. p. 524.

a. ♂. Arfak.
b. Vix ad. ♂. Arfak.
c. Arfak.
d–w. ♂. Arfak (*Bruijn*).
x–z. ♀. Arfak (*Bruijn*).

Iris brown; bill and feet black. Arfak name *Niet*—a phonetic rendering of its cry.

Example *b* is nearly in full plumage; but the metallic green of the head and pectoral shield (the feathers of which latter are incomplete at the sides) is peculiar in being glossed with violet. This violet tinge is apparently a common if not invariable characteristic of immaturity.

151. PARADIGALLA CARUNCULATA, Less.

Paradigalla carunculata, Salvad. *op. cit.* vol. ii. p. 530.

a. ♂. Arfak.
b, c. ♂. Arfak (*Bruijn*).
d–g. ♀. Arfak (*Bruijn*).

Iris red; bill and feet black. M. Laglaize informed me that the colour of the upper caruncle is orange, of the middle bright leaf-green, of the lower red.

The females only differ in their smaller size, in the caruncles and nasal tufts being smaller, and in the absence of the brilliant metallic purple reflections of the upper surface.

152. ASTRAPIA NIGRA (Gm.).

Astrapia nigra, Salvad. *op. cit.* vol. ii. p. 535.

a, b. ♂. Arfak (*Bruijn*).
c–f. ♀. Arfak (*Bruijn*).
g, h. ♂. Arfak.
i. ♀. Arfak.

Iris bright red; bill and feet black. Tail 58–62 centims., wing 18·3–18·7. In the female the tail measures from 30–35 centims., the wing 16·3–17·8. Native name *Aroma*.

The natives say that they do not think that this bird is really much less abundant than the *Epimachus*, although so few skins are ever obtained. They are found in the same district as the latter bird, and, like it, frequent the tops of the high trees, but are very silent; whereas the loud cry of the Great Bird of Paradise at once calls attention to its presence, and causes it to fall a tolerably easy prey to the hunter.

The shafts of the tail- and wing-feathers in this species project beyond the web of the feather, as is the case in *Paradigalla* and *Ptilorhis*.

153. EPIMACHUS SPECIOSUS (Bodd.).

Epimachus speciosus, Salvad. *op. cit.* vol. ii. p. 541.

a–o. ♂. Arfak.
p–v. ♀. Arfak.
w–y. ♂. Arfak (*Bruijn*).
z. Vix ad. ♂. Arfak (*Bruijn*).
a′. Jr. ♂. Arfak (*Bruijn*).
b′, c′. ♀. Arfak (*Bruijn*).

Iris yellow, brown in the young bird; bill and feet black. Length very variable, according to the development of the tail, which in 15 adult males measured from 69 to 84 centims.; wing in male 19·0–20·5, in female 15·7–17·7. Native name in the Arfak *Kambilaia*.

Example *z* has the plumage of the adult bird, except that the side plumes and tail-feathers are just bursting through the feather-cases; there is no trace of brown in the plumage; and it is therefore an old bird, as in the first acquirement of the adult dress the change is effected by means of the gradual assumption of the metallic colours in pre-existing feathers, not by moult.

The hunters found this bird not uncommon in the Arfak, and informed me that it perched on the summit of the trees, and revealed its presence by its loud, harsh cry.

154. DREPANORNIS ALBERTISI, Sclat.

Drepanornis albertisii, Salvad. *op. cit.* vol. ii. p. 549.

a–c. ♂. Arfak (*Bruijn*).

d. ♂. Arfak.

e, f. ♀. Arfak (*Bruijn*).

Iris, according to the hunters, brown; bill black. Length of wing 15·0–15·4; female 14·7–14·8 centims.

The female, though much resembling the male on the upper surface, is of a darker brown in the interscapular region. The small wattle-like expansion of the rictus is less marked.

155. DREPANORNIS BRUIJNI, Oustal.

Drepanornis bruijnii, Salvad. *op. cit.* vol. ii. p. 553.

a. Jr. ♂. ? N. New Guinea, long. 139° E. (*Bruijn*).

b. ♀. Long. 139° E. (*Bruijn*).

While in Ternate Mr. Bruijn showed me the above skins of two birds of the genus *Drepanornis* obtained by his hunters on the north coast of New Guinea a little to the eastward of the mouths of the Amberbaki River. One was marked ♀, the other ♂; but both were destitute of any brilliant colouring whatsoever. The species, though not unlike *D. albertisi*, was recognizable as distinct at a glance, and was evidently not a local variation or representative form of that bird. The greater thickness of the bill, and its colour (buffish horn, not black), the bareness of the base of the maxilla and the nostrils, the large postocular bare patch, the dark-brown head, the brown (not rufous) upper tail-coverts, the dark moustache, the complete and regular barring of the whole of the under surface, including the under tail-coverts—all these easily distinguish it. Each feather on the under surface is barred with from three to five dark brown bars, the last of which is always subterminal. The dimensions seem to be nearly the same as those of *D. albertisi*. Length about 38·0 centims., wing 14·5–15·0, bill from gape (chord) 6·7–7·1.

Mr. Bruijn informed me that his hunters had obtained seven or eight examples of this species, but that, though of different sexes, they were all of the same sober colouring. Judging from the habits of others of the *Paradiseidæ*, notably in the case of *P. rubra*, where the immature males and females appear to live in districts quite apart from the adult male at certain seasons of the year, and from the fact that in this group of birds the males are all of brilliant colouring, we can safely predict that the adult male of this species has yet to be discovered, and that it will probably show a development of subalar plumes closely resembling that of *D. albertisi*.

156. Craspedophora magnifica (Vieill.).

Craspedophora magnifica, Salvad. *op. cit.* vol. ii. p. 554.

a–d. ♂. Near Andai.
e, f. Locality unknown.
g. ♀. Locality unknown.

Iris lemon-yellow with a shade of green, as in *P. minor*; bill and feet black. Wing 17·3–18·3 centims. Native name *Isap.*

The female much resembles that of *Seleucides nigricans*; the general tone of the breast is dirty white, instead of dull yellowish, and the primaries are all chestnut instead of having the inner webs black; but otherwise there is but little difference. While at Samatee, the Rajah of Salwatti informed me that this species existed on the island, but it was neither obtained nor seen by ourselves or our hunters.

157. Seleucides nigricans (Shaw).

Seleucides nigricans, Salvad. *op. cit.* vol. ii. p. 561.

a. ♂. Samatee, Salwatti.
b. Jr. ♂. Samatee.
c–g. Jr. ♂. Salwatti.
h. ♂. Locality unknown.
i. ♀. Locality unknown.

Iris holly-berry red, of female orange; bill black; inside of mouth and throat grass-green; legs and feet the colour of pink coral. In the young bird the feet are flesh-coloured. Length 34·8–37·6 centims. (Salvadori gives 25·0 !); wing 16·5–17·2.

During our visit to Salwatti we were fortunate enough to acquire a living specimen of this exquisite species. The way they are caught appears almost incredible. The native searches in the forest until, by the droppings, he has discovered the usual roosting-place of the species. He conceals himself beneath the tree to discover the exact branch chosen by the bird, and then climbing up at night, quietly places a cloth over it ! The species being exceedingly fond of the fruit of the Pandanus the roosting-places are easily recognized by the *dejecta,* but in three weeks our hunters only secured one bird. This was a male in full plumage (*a*), which afterwards became very tame and lived for many weeks on board the 'Marchesa,' though we were unfortunate enough to lose him before our arrival in England. I find the following notes in my diary:—"The *Seleucides alba* is now wonderfully tame, and will eat out of one's hand. He feeds on the fruit of the Pandanus, on Papaw (*Carica papaya*) when it can be obtained, on cockroaches, and occasionally on banana. He is fond of resting motionless with the head sunk low on the chest. The top of the head is very flat and low, so that the upper margin of the eyes protrudes above it. He remains more or less quiet during the day, but in the morning and evening is more restless, moving from perch to perch with a peculiar bounding hop. In feeding he is most wonderfully *neat.* With his long sharp bill he catches a cockroach with lightning rapidity, taking it across the body. He then gives it a sudden snap with the beak, throws it up in the air, catches it lengthwise, and it is out of sight in an instant. In this operation he displays to advantage the lovely colouring of the inside of the mouth and throat. The only note he has as yet uttered in confinement is a single unmelodious croak."

From the above series and from some native-prepared skins in my possession, the change to adult plumage seems to be thus acquired. The head first assumes its black plumes, with darkening of the feathers, from within outwards, on the neck; the shield appearing gradually meanwhile. The neck now gets darker, and the wing-feathers begin to be tinged with violet, apparently commencing with the secondaries. As yet the lower breast and abdomen have remained unchanged, except that on the flanks the feathers are more plumose. In the next stage the upper parts, head, neck, and breast are complete, the wings tolerably so, while the tail is tinged with violet. The subalar plumes have appeared, but are short, of a dull buff, and barred with brown, though the wires are almost as long as in the adult, but are black with pale tips. The breast is still almost unchanged, except that it is somewhat yellower. The final change that appears to take place is the assumption of the yellow on the breast and plumes, and the deep violet-black tail.

The native name for this bird in Salwatti and the *Rajah ampat* generally is "Palengo."

158. Paradisea minor, Shaw.

Paradisea minor, Salvad. *op. cit.* vol. ii. p. 577.

a–z. ♂. Near Ansus, Jobi.
a′–p′. *Jr.* ♂. Near Ansus.
q′. *Sex. incert.* Near Ansus.
r′–b″. ♂. Dorei Bay.
c″–e.″ *Jr.* Mysol.

Iris lemon-yellow, with a tinge of green. This green shade is sufficiently well marked during life, but fades immediately after death, when the iris appears yellow. Feet and tarsus bluish slate; bill almost lavender. Length of adult Jobi males, without the central tail-feathers, 36·7–41·2 centims.; wing 19·2–20·9.

The above birds, which are only a part of the whole series collected during the voyage of the 'Marchesa,' demonstrate well the gradual change from immature to adult plumage.

The young birds in first plumage exactly resemble the females, but in a short time the purity of the white on the under surface and a marked increase in size render apparent the difference in sex. The yellow of the scapulars becomes more marked, and the green of the throat and yellow of the head begin to appear simultaneously. This green is assumed by the gradual tipping of each feather with that colour (in the adult the apex only of each feather is green), while on the head the brown feathers gradually become yellow from beneath. The plumage of the head and throat having become complete, the two median rectrices begin to elongate, and the lower part of the throat becomes tinged with chestnut. At a further stage the mantle has become more yellow, the chestnut on the throat and breast has extended, and median rectrices, which are still slightly webbed at the tip, protrude some six inches beyond the other feathers. At a still further advanced stage the yellow mantle is complete, the entire breast is chestnut, and the abdomen is becoming so, the wire-like tail-feathers have reached their extreme length, and nothing is therefore wanting to complete the full plumage except the chestnut abdomen and the long subalar plumes, of which latter there is as yet no trace.

I am rather inclined to the belief that the bird remains for some time in this half-perfect plumage. We were fortunate enough in our expedition to New Guinea to obtain no less than four living examples of this species, three of which are at the present moment in the Gardens of this Society. When first obtained, in the month of December, they were in the dress I have just described, and remained thus for some two or three months. The yellow feathers of the head then fell off in two of the four, the birds becoming quite bald in patches, leaving nothing but the black skin showing. At the same time the subalar tufts began to appear. New feathers rapidly appeared on the head; they were almost white at first, but soon assumed the yellow shade. The subalar tufts grew quickly, and were tolerably long within three weeks of their first appearance.

The food given to the birds while on board consisted of boiled rice, banana, papaw fruit, cockroaches, and chopped egg.

We obtained *P. minor* from the mainland of New Guinea, from Mysol, and from Jobi. When in Salwatti I made many inquiries for it, but we did not obtain it, and I was assured that it did not exist on the island. Its abundance in Jobi was wonderful. In the neighbourhood of Ansus, at an altitude of about 1000 feet or less, we obtained no less than fifty-one examples in five days. The known segregation of the older males at certain (or all?) periods of the year partly explains the great preponderance of that sex in the present series. Immature males are also very common, but it is difficult to get females, and there is no doubt a considerable actual preponderance in numbers in favour of the male sex.

159. Paradisea apoda, Linn.

Paradisea apoda, Salvad. *op. cit.* vol. ii. p. 594.

a–s. ♂. (Native skins.) Aru.

t. ♀. Wanumbai, Aru.

During our stay in the Aru Islands, we were only able to procure a solitary individual of this species. At the end of the month of December, we were informed by natives and others that the males were not in plumage, and would not assume the adult dress until April. Mr. Wallace's experience also bears this out, and the males in full plumage in Salvadori's collection were shot during the months of April, May, and June only. It is curious therefore to note that the closely allied *P. minor* appears to remain in plumage the whole year round.

It seems that *P. apoda* is decreasing in numbers in the Arus, or at any rate in the northern islands, where they have been collected for export for more than a hundred years. In the southern islands they may possibly exist in undiminished numbers; but the prices have risen of late years, and while Wallace, in 1857, paid as little as sixpence for the native-prepared skins, they cannot now be obtained at Dobbo under two dollars.

The largest market in the East for the skins of the *burong mati*, or Paradise birds, is at Macassar. Here the commoner sorts are brought in great numbers, made up in parcels of twenty skins, known in the trade as *koddies*. These are all native-prepared skins, for the most part devoid of legs, and useless to the naturalist, besides being generally much moth-eaten. Practically, only six species come into the market:—"males" (*P. apoda*), "females" (*P. minor*), "red birds" (*P. rubra*), "many-wires" (*S. alba*), "green birds" (*D. speciosa*), and "king birds" (*C. regius*); and the trade prices for skins of medium quality per *koddy* are as follows:—

P. apoda	90–100	gulden.
P. minor	70– 90	,,
P. rubra	80–110	,,
S. alba..........	110–130	,,
D. speciosa	50– 70	,,
C. regius	30– 40	,,

The gulden may be reckoned at one shilling and eightpence.

The trade in Macassar is carried on chiefly by a few Dutch merchants, and by various Chinamen, who likewise deal in gum-dammar, pearls, pearl-shell, and other productions of the eastern islands. The greater portion of the skins are sent to Paris, although London absorbs a considerable quantity. But few of them, however, find their way to Holland.

160. Paradisea rubra, Lacép.

Uranornis rubra, Salvad. *op. cit.* vol. ii. p. 623.

a–g. ♂. Waigiou.
h–m. *Vix ad*. ♂. Waigiou.
n–s. *Jr*. ♂. Waigiou.
t–i'. ♀. Waigiou.
k'–n'. ♀. Batanta.
o'. *Jr*. ♂. Batanta.

Iris ruddy brown; bill greenish yellow; feet greenish brown. Length 34·0–36·0 centims., wing 15·5–18·4. Female smaller, length 30·0–34·0 centims., wing about 16·0.

As in the case of most of the Paradiseidæ, the young males are not to be distinguished from the females as far as regards plumage, though the latter are somewhat inferior in size. The first change appears to be the assumption of the metallic green of the head, simultaneously with a slight darkening of the chestnut on the upper breast, and a brightening of the yellow on the neck and wing-coverts. The two median rectrices then commence to elongate, and after a time the web of the feather becomes eroded. It still remains webbed at the base, however, and generally carries a spatula for some time. Indeed, this spatula may sometimes be seen in the full, or nearly full, plumaged bird. In the process of elongation the shaft becomes thin and widened, though still remaining of a brown colour; and although Salvadori doubts whether the curious quill-like plumes of the full plumage are assumed without moult, an individual of the present series shows that this is the case, and that the result is produced by the gradual incurving of the already flattened shaft. The last stage is in the appearance of the red subalar plumes, from which the bird derives its specific name.

I have noticed that the females and quite young males seem alike to have the two median rectrices somewhat narrow and rather *shorter* than the others, and that the prolongation of these is not invariably a change of the earliest period.

The Batanta birds appear to have the yellow less bright. There is less of it on the back, and it merges into the black of the forehead without the distinct line over the vertex as in the others.

161. Diphyllodes magnifica (Penn.).

Diphyllodes magnifica, Salvad. *op. cit.* vol. ii. p. 634.

a–c. ♂. Salwatti? (*Bruijn*).

d. ♂. Salwatti.

Iris brown; bill greyish blue; feet bright blue. Length about 22·0 centims., wing 11·3. This bird is known to the hunters of the Rajah Ampat as *Bila rotan*, Malay for "cut rattan"—from the appearance of the yellow mantle, which is certainly not unlike a sloping section of a large rattan.

I cannot help regarding this species as decidedly rare, for in spite of the large collections we obtained in Mysol, Salwatti, and the Arfak, not one single example of this species was shot either by ourselves or our own hunters.

162. Diphyllodes chrysoptera, Gould.

Diphyllodes chrysoptera, Salvad. *op. cit.* vol. ii. p. 641.

a. ♂. Ansus, Jobi (*Bruijn*).

b. ♀. Ansus (*Bruijn*).

Mr. Laglaize informed me that the iris of the male is yellowish. The bill and feet are as in *D. magnifica.*

We were unable to obtain this species during our visit to Jobi, and it seems to be far from common on that island. I have seen skins intermediate between this and the last species from the eastern side of Geelvink Bay; and I feel certain that a series from this locality and Jobi would show that the two so-called species are in reality not separable.

163. Diphyllodes wilsoni (Cass.).

Schlegelia respublica, Salvad. *op. cit.* vol. ii. p. 642.

a–d. ♂. Marchesa Bay, Batanta.

e–g. ♀. Marchesa Bay.

h–k. Jr. ♀. Marchesa Bay.
l. Jr. ♂. Chabrol Bay, Waigiou.
m. ♂. Waigiou.

Iris brown, of female greyish brown; bill black, tip of upper mandible brownish; feet and legs bright blue, darker in the female. Inside of mouth bright greenish yellow in both sexes. Length, exclusive of long rectrices, 18·5–20·0 centims., wing 9·4–9·8. Shot in October and November. Malay name *Kapala kruis* (Cross-head).

The bare occipital patch is of the brightest imaginable blue during life; the figure in Gould's 'Birds of New Guinea' gives no notion of the extreme brilliancy of the colouring of this part. In the female and young male it is not quite so bright. It begins to fade almost immediately after death, is quite dull in four or five hours, and by next day the skin is as black as in a long-shot specimen. The curved tail-feathers also seem to lose their colour, contrary to what is usually the case in plumes of metallic colouring. Before fading they are of a bright steely purple.

The immature male differs in no way from the female. Of the change of plumage to the adult dress, I can, however, give no information. The species occurred to us most commonly at the east end of Batanta, but it was far from abundant. It frequented hills of about 1000 feet in height, at a distance of about half a mile from the sea.

164. CICINNURUS REGIUS (Linn.).

Cicinnurus regius, Salvad. *op. cit.* vol. ii. p. 646.

a, b. ♂. Arfak.
c–f. ♂. Andai.
g–l. Jr. ♂. "New Guinea."
m–o. ♂. Salwatti.
p. ♀. Salwatti.
q. Jr. ♂. Salwatti.
r–r'. ♂. Mysol.
s'–g''. Jr. ♂. Mysol.
h''–l''. ♀. Mysol.
m''–q''. ♂. Jobi.
r''–t''. Jr. ♂. Jobi.
u''. ♀. Jobi.
v''–b'''. Mysol.

Iris brown; bill yellowish horn-colour, becoming quite yellow in the dried skin, in the female and young male brownish; legs and feet bright blue, somewhat duller in the female; inside of mouth bright yellowish green. Total length, not including median rectrices, 17·0–19·4 centim., of females and young males 19·0–21·0, the larger measurements depending on the greater length of the tail in the latter. Wing 9·8–10·4 centims. Native name among the hunters of the Rajah Ampat, *Kepin-kepin.*

In the large series obtained on the 'Marchesa's' cruise, of which the above are a portion only, the various changes in the plumage from youth to adult age are well exemplified. The young male is at first not to be distinguished from the female, but after a time the first signs of the full plumage become evident in the case of the former, either by the appearance of a few scattered red feathers on the head and neck, or by the gradual reddening of the external surface of the wings. At the same time the median rectrices begin to elongate. At first brown, they soon acquire a red tinge, and, when an inch or two longer than the others, become eroded on the inner web, and somewhat curved, so that the feather is sickle-shaped. This curvature becomes more pronounced, ultimately assuming the shape of the perfect feather, though the colour of the web still remains brown. The shaft then becomes completely denuded of feather, and the terminal disk acquires the brilliant metallic green colouring of the perfect plume.

This development has gone on contemporaneously with the change in the general plumage. The whole of the back and upper surface having become more or less red in patches, the colour being assumed gradually by each feather, and not by moult, each feather becoming at first yellowish, then red,—a change is seen in the under surface, the feathers of the abdomen turning gradually white, while simultaneously signs of the metallic green pectoral band appear. Simultaneously also, the subalar plumes commence to grow, a process which in the genus *Paradisea* is the final stage towards the completion of the full plumage. They are at first ruddy, barred with greyish brown, while the tips, which are destined later to become metallic green, are buff. The final change consists in the assumption of the colour in the tips.

It is impossible to examine a large series of *C. regius*, such as the above, without noticing certain differences with regard to locality, which, though slight, appear to be tolerably constant. Taking the Mysol examples, which seem to be possessed of no marked characteristics, as a standard, the birds from Aru, Jobi, and the Arfak region present the most noteworthy peculiarities. They may be shortly summarized as follows:—

Aru. Birds large; very yellow on the head; supraocular spot large; tails long; disks small. Tendency to a bronze tint on the metallic green.

Jobi. Beak shorter, the apex projecting but a short distance beyond the nasal tufts. Supraocular spot small. Violet tinge of throat strongly marked.

Arfak. Birds small. Tail very short; disks large.

A female from Jobi island is characterized by being of a dark mouse-brown on the back and head.

Although we never obtained *C. regius* in Batanta, I on one occasion doubtfully, and on another certainly, saw it at the south-east end of that island. But for this, I should have had great doubts of its existence in that locality.

165. Xanthomelus aureus (Linn.).

Xanthomelus aureus, Salvad. *op. cit.* vol. ii. p. 658.

a, b. Jr. ♂. Near Dorei (?).

The above two skins, the sex of which is not indicated, were obtained from a Malay in Dorei, in which locality they were supposed to have been shot. The upper surface is brown, slightly olivescent, darker on the head, the mantle streaked with yellow, owing to the shaft of each feather being of that colour. Throat and sides of the head pale brown; upper breast barred with brown, producing an imbricated appearance; rest of under surface bright yellow. Under wing-coverts and inner webs of primaries yellow, the former marked with brown. Shafts of wing- and tail-feathers yellow beneath. Bill and feet brownish black in the dried skin. The specimens are, no doubt, immature males.

We were unable ourselves to obtain examples of this species in Salwatti, but at Samatee on that island we procured three flat skins of adult males from a native. Their origin was, however, uncertain, and it is more than possible that they were brought from Sorong on the mainland.

The Arfak name for *X. aureus* is *Kumeda.*

166. Ælurœdus buccoides (Temm.).

Ælurœdus buccoides, Salvad. *op. cit.* vol. ii. p. 675.

a. Dorei.
b. ♂. N. New Guinea, long. 139° E. (*Bruijn*).
c. ♂. Ansus, Jobi.
d. ♀. Batanta.
e. ♀. Salwatti.

Iris red-brown; bill and feet slate-coloured. Length 25·5 centims., wing 13·3–14·3 centims. Jobi is a new locality for this species, but the present example differs but little from the others, except in its somewhat larger size. Examples *a* and *d* have the apices of the outer tail-feathers slightly tipped with white.

167. Ptilopus superbus (Temm.).

Ptilopus superbus, Salvad. *op. cit.* vol. iii. p. 6.

a, b. ♂. Mysol.

Iris yellow; bill slate, yellow at tip; feet red. Length 23·3–24·0 centims., wing 13·0.

Both skins are characterized by the great breadth of the purple pectoral band.

168. Ptilopus pulchellus (Temm.).

Ptilopus pulchellus, Salvad. *op. cit.* vol. iii. p. 13.

a–d. ♂. Waigiou.
e. ♀. Waigiou.
f. ♂. Mysol.

Iris dark yellow; bill yellow, green in the female *e*, tarsus dark red. Length 19·5–20·4 centims., wing 10·1–10·8. Sexes alike.

169. Ptilopus geminus, Salvad.

Ptilopus geminus, Salvad. *op. cit.* vol. iii. p. 19.

a. ♂. Jobi (*Bruijn*).

Salvadori's description, "*macula abdominis medii transversa pallide violacea, croceo circumdata,*" is perhaps not strictly accurate. The small violet patch is bounded below and on the sides only by the saffron of the abdomen.

170. Ptilopus humeralis, Wall.

Ptilopus humeralis, Salvad. *op. cit.* vol. iii. p. 23.

a. ♂. Waigiou.

Bill greenish, yellow at apex; tarsus dull red. The existence of this species in Waigiou has not been previously recorded.

171. Ptilopus wallacei, G. R. Gr.

Ptilopus wallacei, Salvad. *op. cit.* vol. iii. p. 30.

a. ♂. Dobbo, Aru.

b. ♂. Locality unknown.

Iris dirty yellow; bill greenish yellow; tarsus red. Length 25·5 centims., wing 14·5–15·5.

172. Ptilopus ornatus, Rosenb.

Ptilopus ornatus, Salvad. *op. cit.* vol. iii. p. 32.

a. ♂. Andai.

Iris orange; bill yellow; feet reddish purple. The under tail-coverts are white rather than pale yellow as in Salvadori's description.

173. Ptilopus prasinorrhous, G. R. Gr.

Ptilopus prasinorrhous, Salvad. *op. cit.* vol. iii. p. 41.

a–d. ♂. Traitors Islands, N. of Jobi (*Bruijn*).

e. ♀. Traitors Islands (*Bruijn*).

These examples do not differ from others obtained from more western localities.

174. Ptilopus bellus, Sclat.

Ptilopus bellus, Salvad. *op. cit.* vol. iii. p. 45.

a. ♂. Andai.

b–d. ♀. Arfak (*Bruijn*).

Iris yellow; bill yellow; feet dark red. In two of the females the secondaries towards the apex are strongly edged on the outer web with bright yellow.

From the occurrence of this bird at Andai it is evident that the species is not, as has previously been supposed, confined to the mountainous districts.

175. Ptilopus speciosus, Rosenb.

Ptilopus speciosus, Salvad. *op. cit.* vol. iii. p. 47.

a, b. ♂. Traitors Islands (*Bruijn*).

c. ♀. Traitors Islands (*Bruijn*).

The little group to the S.E. of Biak, known as the Pade Aido, or Traitors Islands, appear, as far as I could judge from a small collection obtained by Mr. Bruijn's hunters, to belong, ornithologically speaking, to the Mysory division of the Geelvink-Bay islands.

176. PTILOPUS PECTORALIS (Wagl.).

Ptilopus pectoralis, Salvad. *op. cit.* vol. iii. p. 60.

a. ♂. Mysol.
b. ♀. Waigiou.
c. ♀. Locality unknown.

Iris dark yellow; bill yellow; feet dark red. Length 20·5–22·5 centims., wing 11·0.

The female of this species much resembles that of *P. prasinorrhous*, but is distinguished by its smaller size and its shining green wings; and also by the under tail-coverts being white tipped with yellow, the inner web green, while in *P. prasinorrhous* the tail-coverts are dark green edged with yellow.

177. MEGALOPREPIA PUELLA (Less.).

Megaloprepia puella, Salvad. *op. cit.* vol. iii. p. 66.

a–d. ♂. Waigiou.
e, f. ♀. Waigiou.
g, h. ♂. Batanta.
i. ♀. Batanta.
k. ♂. Mysol.
l, m. ♀. Mysol.
n, o. ♀. Salwatti.

Iris bright red, orange, or yellow, irrespective of locality; bill red at base, tip yellow; tarsus green, or yellowish green. Length variable, 31·8–36 centims., wing 15·8–17·1. Sexes alike. But little variation is apparent in the plumage of the above examples.

178. CARPOPHAGA MYRISTICIVORA (Scop.).

Carpophaga myristicivora, Salvad. *op. cit.* vol. iii. p. 74.

a. ♂. Waigiou (Nov. 11th).
b. Batanta.

Iris indian red, brown in *a*; bill and cere black; feet red. Length 45–46 centims., wing 27·5. Cere not large.

Salvadori doubts the accuracy of the locality in two of Bruijn's examples said to have been obtained from Halmaheira. It is, however, not improbably correct, as we obtained this species in numbers on the Weda Islands, which lie at the S.E. extremity of Gilolo.

179. CARPOPHAGA ZOEÆ (Less.).

Carpophaga zoeæ, Salvad. *op. cit.* vol. iii. p. 94.

a. ♂. Wammar, Aru.

Iris white; bill greenish slate; tarsus dull pinkish red. Length 43·2 centims., wing 22.

180. Carpophaga rufiventris, Salvad.

Carpophaga rufigaster, Q. et G.
Carpophaga rufiventris, Salvad. *op. cit.* vol. iii. p. 98.
a–d. ♂. Waigiou.
e. ♀. Salwatti.
f. ♂. Mysol.
g. ♀. Andai.
h. ♀. Batanta.
i. Locality unknown.

Iris red; bill dark brown or black; feet dull red; bare space round eye red. Length 36·8–38·0 centims., wing 18·5–19·2.

The prolonged upper tail-coverts of one of the Waigiou birds are very dark, almost greenish black. The Andai bird is characterized by the brilliant cupreous-red iridescence of the back.

181. Carpophaga chalconota, Salvad.

Carpophaga chalconota, Salvad. *op. cit.* vol. iii. p. 100.
a–d. Arfak.

Four birds, sex unknown, brought down by the Arfak hunters. Wing 19·5–21·0 centims.

C. rufiventris much resembles this species, but may be distinguished by its vinaceous head, by the bright rufous of the upper breast, and by the purple-brown (not dark blue) tail. The beak also is smaller in the former.

182. Carpophaga muelleri (Temm.).

Carpophaga müllerii, Salvad. *op. cit.* vol. iii. p. 101.
a. Dobbo, Aru (Dec. 4th).

Iris brown; bill dark slate; tarsus dark vinous red. Length 45·5 centims., wing 23·7, bill from gape 3·8.

This was the only occasion on which we met with this fine Pigeon, which does not seem common in the Arus.

183. Carpophaga pinon (Q. et G.).

Carpophaga pinon, Salvad. *op. cit.* vol. iii. p. 103.
a–d. ♂. Waigiou.
e. ♀. Waigiou.
f, g. ♂. Batanta.
h. ♀. Batanta.
i, k. ♂. Mysol.
l. ♀. Mysol.
m, n. ♂. Dobbo, Aru.
o. ♀. Dobbo.

Iris, outer ring dull, inner bright red. In others this double ring is absent, the iris being dull indian red, sometimes purple. Bill greyish horn-colour, bluish at the apex. Bare space surrounding the eye bright red. Feet red.

This species appears to vary very much in size. The average length is from about 47 to 48 centims., but a Mysol example only measures 40·0 centims. The Waigiou birds seem largest.

C. pinon is an abundant bird in the Papuan Islands mentioned above, and is often to be found in small flocks of four or five individuals. In several examples of the present series the web of the feather is worn off in the white bar which crosses the tail, thus producing a singular fenestrated appearance.

184. MYRISTICIVORA SPILORRHOA, G. R. Gr.

Myristicivora spilorrhoa, Salvad. *op. cit.* vol. iii. p. 111.

a. ♀. Dobbo, Aru.

Iris almost black; bill slate, yellow at apex. Feet slate-blue. Length 44·0 centims., wing 24·6.

Under tail-coverts and tibials with a subterminal black spot; external rectrices with a very narrow apical black band. It is worthy of note that, whether "the assertions of Bonaparte, Cassin, and Lord Walden are founded on individuals with two tail-feathers accidentally wanting," or not, the present example has only 12 rectrices.

185. GYMNOPHAPS ALBERTISI, Salvad.

Gymnophaps albertisii, Salvad. *op. cit.* vol. iii. p. 118.

a–c. Arfak (*Bruijn*).

d. ♂? Jobi.

Iris in the Jobi bird blood-red; bill and circumocular space brilliant red.

This example, *d*, differs in having the chin and gular region grey rather than chestnut; the latter colour being confined to the auricular region. The breast is slightly spotted with grey, which is not the case in the other skins. The species has not, as far as I am aware, been hitherto recorded from Jobi.

186. REINWARDTŒNAS REINWARDTI (Temm.).

Reinwardtœnas reinwardtii, Salvad. *op. cit.* vol. iii. p. 124.

a–c. ♂. Waigiou.
d. Jr. ♂. Waigiou.
e. Jr. ♀. Waigiou.
f. ♂. Waigiou.
g. ♀. Batanta.
h. Batanta.

Iris, inner ring yellow, outer red; bill red at base, apex brown or slate-coloured. Feet and bare space round eye red. Length very variable; wing 23·0–24·2 centims.

In *d* the head is brown, with a few scattered white feathers. There are splashes of brown on the upper breast and back, and the bill and feet have not yet assumed the red colour of the adult. Example *e* is also immature, and has ruddy feathers on the breast and neck.

187. Macropygia nigrirostris, Salvad.

Macropygia nigrirostris, Salvad. *op. cit.* vol. iii. p. 149.

a. Locality unknown.

With faint barring on the back and interscapulars, and over the whole of the outer surface of the wing.

188. Phlogœnas rufigula (Puch. et Jacq.).

Phlogœnas rufigula, Salvad. *op. cit.* vol. iii. p. 161.

a. ♂? Salwatti.

b. Arfak.

Iris pink; bill brown; feet purple-madder. Length 23·5 centims., wing 12·5–13·2.

The Arfak bird differs in having the grey supraocular stripe much more marked, and the rufous of the vertex merging gradually into the brownish occiput. In the Salwatti bird there is a sharp boundary line here, and the occipital region is much darker. Beneath, in the latter example, the crissum and tibials are isabelline.

189. Henicophaps albifrons, G. R. Gr.

Henicophaps albifrons, Salvad. *op. cit.* vol. iii. p. 183.

a. ♂. Waigiou.

Iris black; bill slate; feet coral.

With the white forehead edged round faintly with pale fulvous, more marked posteriorly.

190. Eutrygon terrestris (G. R. Gr.).

Eutrygon terrestris, Salvad. *op. cit.* vol. iii. p. 186.

a. ♀. Andai.

Iris red; bill with the base dark slate-colour, the apex whitish; feet pink. Length 37·5 centims., wing 18·0.

191. Otidiphaps nobilis, Gould.

Otidiphaps nobilis, Salvad. *op. cit.* vol. iii. p. 188.

a. Dorei (?).

b, c. Arfak.

Example *a* was obtained from a native in Dorei Bay, and was believed to have been shot in the vicinity. While in Waigiou I was informed by the natives that a bird, apparently of this species, inhabited the island, which is not improbable, as Von Rosenberg has met with it in Batanta. The hunters of the Rajah Ampat know this species by the name of *Rajah Maleo*!

192. Goura coronata (Linn.).

Goura coronata, Salvad. *op. cit.* vol. iii. p. 191.

a, b. ♂. Waigiou.

c. ♀. Waigiou.

d. ♂. Mysol.

e. ♂. Dorei.
f. ♀. Dorei.

Iris red; tarsus dull red, irregularly marked with white; feet brighter; bill bluish.

The above are only a portion of the large series of skins obtained during the voyage of the 'Marchesa.' The abundance of the species is wonderful, especially in Waigiou, and the fact that at one time we had twenty-five living birds on board shows the facility with which they are trapped by the natives.

193. GOURA VICTORIÆ (Fraser).

Goura victoriæ, Salvad. *op. cit.* vol. iii. p. 205.

a. ♀. Near Ansus, Jobi.
b. Juv. Near Ansus.

Iris red; feet dull red; bill bluish, lighter at apex.

The young bird only differs in its much smaller size (48·1 centims.), in the absence of the chestnut tips to the greater wing-coverts, and in the lesser amount of white on the crest.

We obtained only three of these birds while in Jobi, from which it is probable that the species is not very abundant.

194. CALŒNAS NICOBARICA (Linn.).

Calœnas nicobarica, Salvad. *op. cit.* vol. iii. p. 209.

a–c. ♂. Waigiou.
d. ♂ *juv.* Waigiou.
e. ♀. Waigiou.
f. ♂. Salwatti.

Iris dull red, or reddish brown; bill and cere black; feet dull reddish, yellowish beneath. Length about 38·0 centims., wing 24·0–25·5.

195. MEGAPODIUS DUPERREYI, Less. et Garn.

Megapodius duperreyi, Salvad. *op. cit.* vol. iii. p. 219.

a. Dorei.

Iris brown; bill brown; tarsus reddish orange.

196. MEGAPODIUS FREYCINETI, Q. et G.

Megapodius freycineti, Salvad. *op. cit.* vol. iii. p. 230.

a, b. ♂. Waigiou.
c. ♀. Waigiou.
d. ♀. Momos, Waigiou.

Iris brown, or dark indian red; bill brown, lighter at the apex; tarsus and feet dark brown or black, claws black. Length 35·3–39·8 centims., wing 22·0–22·7.

An apparently abundant species in Waigiou.

197. TALEGALLUS JOBIENSIS, Meyer.

Talegallus jobiensis, Salvad. *op. cit.* vol. iii. p. 243.

a. ♂. Jobi (*Bruijn*).

In the dried skin the beak is brown.

198. Talegallus cuvieri, Less.

Talegallus cuvieri, Salvad. *op. cit.* vol. iii. p. 245.

a. ♂. Salwatti.
b. *Juv.* Salwatti.
c. ♀. Dorei Bay.

Iris yellowish red; bill orange-red; feet orange; bare skin of throat reddish brown. Example *c* has a small collar of brown feathers on the nape. The young bird differs in being much smaller, and of a duller black.

199. Rallicula rubra, Schleg. (Plate XXXIX.)

Rallicula rubra, Salvad. *op. cit.* vol. iii. p. 270.

a. ♂. Arfak (*Bruijn*).

Under wing-coverts and whole of the under surface of the wing, barred with white.

200. Orthorhamphus magnirostris (Geoffr.).

Orthorhamphus magnirostris, Salvad. *op. cit.* vol. iii. p. 290.

a. ♂. Mysol.

Iris yellowish; bill black; tarsus olive-green. Length 52·0 centims., wing 28·0.

201. Charadrius fulvus, Gm.

Charadrius fulvus, Salvad. *op. cit.* vol. iii. p. 294.

a. ♀. Momos, Waigiou (Oct. 25th).

In changing plumage; breast and abdomen yellowish, interspersed with black feathers.

202. Ægialitis geoffroyi (Wagl.).

Ægialitis geoffroyi, Salvad. *op. cit.* vol. iii. p. 298.

a. Momos, Waigiou (Oct. 27th).

In winter plumage, and with no grey pectoral band.

203. Ægialitis mongolica (Pall.).

Ægialitis mongolica, Salvad. *op. cit.* vol. iii. p. 299.

a. ♂. Batanta (Oct. 22nd).

In winter plumage.

204. Tringa acuminata (Horsf.).

Tringa acuminata, Salvad. *op. cit.* vol. iii. p. 313.

a. ♂. Momos, Waigiou (Oct. 26th).

Iris brown; bill brown; feet and tarsus olive. Length 22·0 centims., wing 14·0. Plumage changing.

205. Tringoides hypoleucus (Linn.).

Tringoides hypoleucus, Salvad. *op. cit.* vol. iii. p. 318.

a. ♂. Waigiou.
b. ♀. Mysol.

Iris dark brown; bill brown; tarsus dull olive. Length 20·0 centims. Obtained in November.

206. TOTANUS INCANUS (Gm.).

Totanus incanus, Salvad. *op. cit.* vol. iii. p. 320.

a. ♂. Waigiou (Nov. 11th).
b. ♀. Waigiou (Oct. 29th).
In *a* there are only slight traces of barring on the breast.

207. TOTANUS GLAREOLA (Linn.).

Totanus glareola, Salvad. *op. cit.* vol. iii. p. 323.

a. ♂. Momos, Waigiou (Oct. 24th).
This species has not hitherto been recorded from the Papuan subregion.

208. SCOLOPAX ROSENBERGI, Schleg.

Scolopax rosenbergii, Salvad. *op. cit.* vol. iii. p. 335.

a. ♀. Arfak (*Bruijn*).
This individual corresponds with Salvadori's description of *S. rosenbergi*, but I have had no opportunity of comparing it with skins of that species.

209. DEMIEGRETTA SACRA (Gm.).

Demiegretta sacra, Salvad. *op. cit.* vol. iii. p. 345.

a. ♂. Samatee, Salwatti.

210. ARDETTA SINENSIS (Gm.).

Ardetta sinensis, Salvad. *op. cit.* vol. iii. p. 363.

a. ♀. Andai.
Iris chrome-yellow; bill yellowish horn; culmen brown; tarsus and feet light green, soles of feet yellow. Length 37·0 centims., wing 14·0.

211. NYCTICORAX CALEDONICUS (Gm.).

Nycticorax caledonicus, Salvad. *op. cit.* vol. iii. p. 372.

a. ♂. Salwatti.

212. TADORNA RADJAH (Garn.).

Tadorna radjah, Salvad. *op. cit.* vol. iii. p. 391.

a. ♀. Waigiou (January).
b. ♀. Ansus, Jobi (November).
Iris white; bill and tarsus yellowish white; claws blackish. Length 49·7 centims., wing 24·7–28·0.
Jobi is apparently a new locality for this species.

213. MICROCARBO MELANOLEUCUS (Vieill.).

Microcarbo melanoleucus, Salvad. *op. cit.* vol. iii. p. 410.

a. ♂. Mysol.
b. ♀. Chabrol Bay, Waigiou.
Iris brown; bill yellow, reddish at base; culmen black. Length 59·5–61·0 centims.
Example *a* has some of the wing-coverts white.

3. A Description of the German River-Frog (*Rana esculenta*, var. *ridibunda*, Pallas). By G. A. Boulenger, F.Z.S.

[Received June 4, 1885.]

(Plate XL.)

When I received a year ago a large number of *Rana esculenta* from Berlin, I was so struck by the differences they presented that I had no hesitation in regarding them as of two distinct races or subspecies, and I bestowed upon the one which was new to me, and to which attention had previously been called by Prof. Pflüger [1], the name of *R. fortis*. As I had not then sufficient material to establish a comparison with all the forms which had already been named by various authors, this seemed to me the best course, my object being to draw immediate attention to the remarkable fact of two distinct closely allied forms occurring in the same locality, reserving for a future occasion an investigation into the chaotic synonymy. I have since constantly been amassing material; and I think I may flatter myself on having now before me the finest and largest series of specimens of *R. esculenta* with accurate localities which has ever been brought together. Unfortunately, the more specimens I examine, the more difficult the subject appears; and I should not think of attempting at present a general revision of the races of this widely distributed species. It is evident that under the name *Rana esculenta* a number of forms are thrown together, the extremes of which are as distinct as many we are accustomed to regard as valid species; but as they are linked together by numerous insensible gradations, it is best to regard them as subspecies.

The great number of specimens, both alive and in spirits, which have lately passed through my hands, have more and more strengthened my belief in the constancy of the characters upon which I have based the distinction of *R. fortis* and *R. esculenta*; but they have also convinced me that the name *R. fortis* should be cancelled in favour of the name *R. ridibunda*, Pallas.

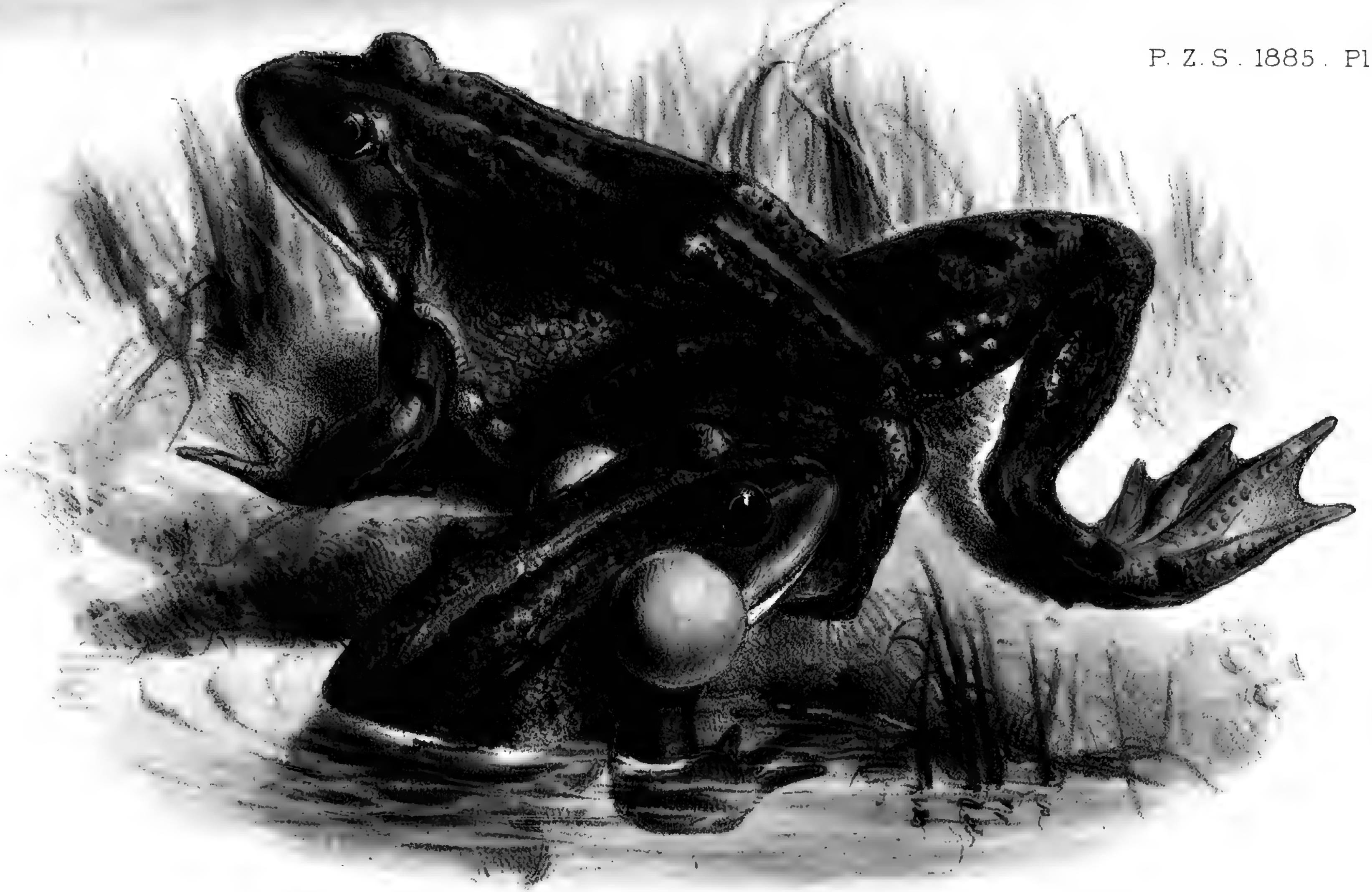
My object at present being merely to give a detailed account of the recently discovered German Frog, I will leave aside all further material in order to avoid confusion, and all that is said of *R. esculenta* for comparison applies only to German specimens. The following description is based on the examination of about 130 specimens of *R. ridibunda*, of which six are from Prague, the rest from Berlin.

Rana esculenta, var. ridibunda.

Rana ridibunda, Pallas, Reise, i. p. 458 (1771).

Rana cachinnans, Pallas, Zoogr. Ross.-As. iii. p. 7, pl. i. figs. 1, 2 (1831); Eichwald, Faun. Casp.-Cauc. p. 126, pl. xxx. (1841).

[1] Arch. f. Physiol. xxix. 1882, p. 67.



P. Smit del. et lith. Mintern Bros. imp.

RANA ESCULENTA, VAR. RIDIBUNDA.

Rana esculenta, var., Pflüger, Arch. f. Phys. xxix. p. 67 (1882), and xxxii. p. 522 (1883).

Rana fortis, Boulenger, The Zoologist, xlii. p. 220 (1884).

Diagnosis.—A large, strongly built form, with long hind limbs, the *tibia proportionately longer* than in the typical form; *inner metatarsal tubercle relatively small, elliptical, feebly prominent, not compressed,* measuring 2 to $4\frac{1}{2}$ millim. in specimens in which the inner toe measures 9 to 15 millim. Olive, bronzy olive, or dull green above, with blackish-olive spots; usually a pale green vertebral band; no yellow on any part of the body; *hinder side of thighs olive, or greenish white marbled with dark olive.* Vocal sacs grey.

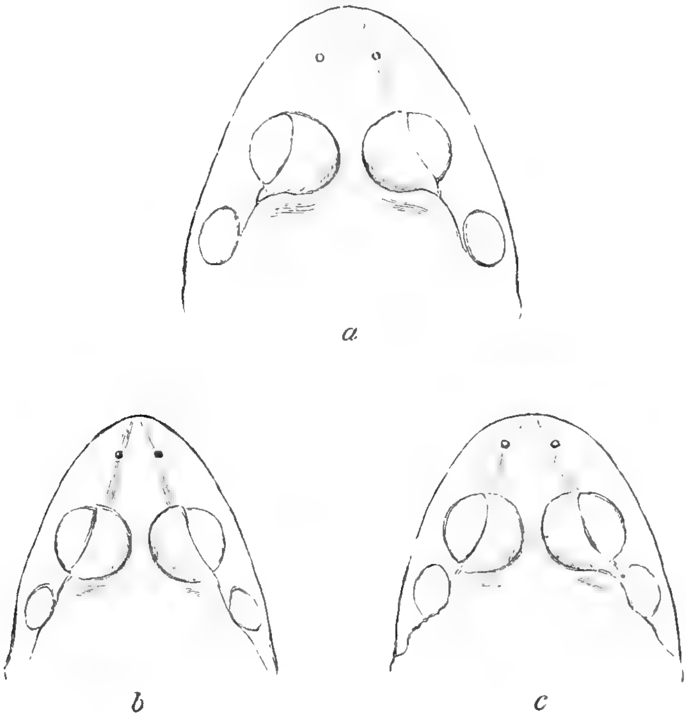
Dimensions.

	♂. millim.	♀. millim.
From snout to vent	98	104
Length of head	30	32
Width of head	32	36
Diameter of the eye	8	8
Interorbital space	3	3
From the eye to the nostril	6	7
From the eye to the tip of the snout	13	15
Diameter of the tympanum	6	7
Fore limb	48	49
Hind limb	135	160
Tibia	42	50
Foot (from outer metatarsal tubercle)	44	51
Inner toe (from inner metatarsal tubercle)	12	15
Inner metatarsal tubercle	4	4·5

Description.—The snout is normally broadly rounded, its length measuring half its width (from a transverse line passing on the anterior border of the orbits); in the extremes it measures two fifths or three fifths its width, as seen in the accompanying figures (Fig. 1, p. 668, where *a* and *c* represent the two extreme forms, fig. *b* the normal). The canthi rostrales are obtuse, and the loreal regions very oblique. The nostril is nearly equidistant from the eye and the end of the snout. The interorbital space is very narrow, measuring less than half the width of the upper eyelid, and usually more or less distinctly grooved longitudinally. The diameter of the tympanum equals half, or nearly half, that of the orbit.

The hind limb being stretched forwards, the tibio-tarsal articulation reaches the eye or halfway between the latter and the end of the snout; there is no considerable difference in respect to the sexes. The legs or tibiæ being folded against the thighs and maintained at right angles to the vertebral column, their extremities overlap; to ascertain this character with precision, it is necessary not to force the tibial extremities together, but to allow due space for the fleshy parts. In the typical *R. esculenta*, the extremities of the tibia either abut or are separated by a short interspace. This of course implies a greater length of the tibia proportionally to the femur in *R. ridibunda.* The foot is fully webbed; its length, from the outer metatarsal tubercle to the end of the fourth toe, equals half the distance from the vent to the nostrils or the tip of the snout, or a little more. The subarticular tubercles of the toes as well as of the fingers are rather small and feebly prominent. The inner metatarsal tubercle is elliptical, blunt, much less prominent than in the typical

Fig. 1.

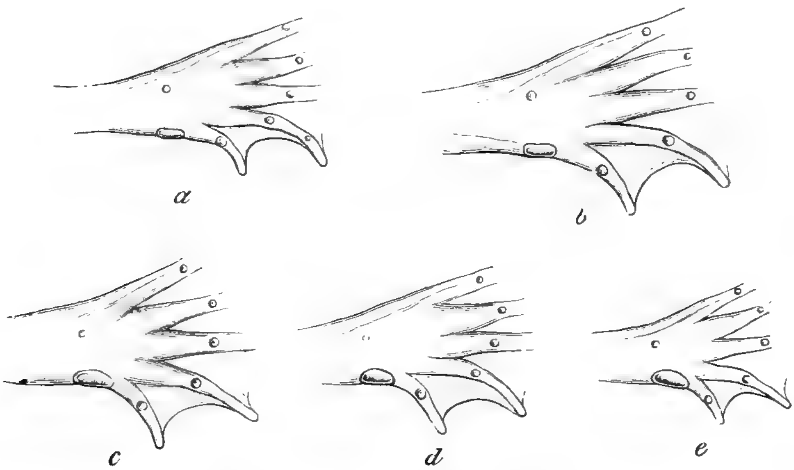


Heads of *Rana esculenta.*

R. esculenta; it is also smaller compared with the inner toe, its length seldom equalling, and never exceeding, its distance from the subarticular tubercle of that toe. In the typical form the metatarsal tubercle is always more prominent, more or less strongly compressed, frequently crescentic in shape; its length at least equals, and usually considerably exceeds, its distance from the subarticular tubercle. However, the length of the metatarsal tubercle is, like all characters, subject to a certain amount of variation; the smaller variety of the typical *R. esculenta*, which occurs along the Rhine, has usually the tubercle larger than in the larger variety of the same form as occurring in Berlin and elsewhere, and to which Rösel's *Rana viridis* belongs. It is a fact that a graduated series may be formed from the *R. ridibunda* with very small tubercle to the *R. esculenta* with very large tubercle, and such a series is represented in the accompanying figures (Fig. 2, p. 669).

The skin of the back and hind limbs is more or less warty, seldom nearly smooth. The glandular lateral fold is moderately prominent and constantly broad, as broad as or even broader than the upper eyelid. The coloration is far less variable than in the typical *R. esculenta.* In the normal condition the ground colour of the upper parts is olive or bronzy-olive, with the vertebral band, the fore limbs, and the sides of the head and body pale green or pale olive. But, of course, through the play of the chromatophores, the same individual may pass successively from a very light to a very dark hue, according to its being placed in very dry or very moist surroundings. In specimens long kept in the water, the colour turns to a very dark bronze-olive, almost blackish, in which case the

Fig. 2.



a, b. R. ridibunda, Berlin; *c. R. esculenta,* Berlin; *d. R. esculenta,* Basle; *e. R. esculenta,* Düsseldorf.

normally darker markings may assume a brighter greenish tint; but if these markings are examined with a magnifying glass, they are seen to be black beautifully powdered with gold. The vertebral band varies considerably in width, and may be absent altogether. The glandular lateral folds are usually not conspicuously lighter-coloured, though sometimes metallic bronzy. The spots on the back and flanks are more or less numerous, and the hind limbs are transversely banded, but these markings are of a blackish-olive or bronzy-brown, and never of an intense black as is frequently the case in *R. esculenta.* The dorsal spots sometimes form pretty regular longitudinal series, but are never confluent into longitudinal bands. A dark canthal and supratemporal streak is usually present, and the latter portion sometimes expands into a regular temporal spot. The edge of the upper lip is either spotless or with a series of blackish spots which very seldom unite to form a labial streak. The cross bands on the legs may be very irregular or absent. The hinder side of the thighs, *i. e.* that part which is concealed by the legs when the animal is at rest, are whitish or pale greenish marbled with dark olive or bronzy, or of the latter colour with or without small light spots; never is any trace of yellow to be detected on that region nor at the axil and groin, a character which well distinguishes this form from the true *R. esculenta*. The lower surfaces are white, with greyish spots or marblings in specimens kept dry; after long sojourn in water, these parts are abundantly spotted or largely marbled with black. The abundance and intensity of these spots is irrespective of sex, a remark which, contrary to the statement of many authors, applies also to *R. esculenta*. The iris is black, veined with gold, the latter pigment being in far lesser abundance than in *R. esculenta*. The vocal sacs, which do not differ in size or position from those of the typical form, are strongly pigmented with black, pale grey when swollen out.

The examination of the skeleton has failed to reveal any constant peculiarities supplementing the external characters.

Biological.—Not having had the privilege of observing this Frog in its haunts, I cannot do better than reproduce Prof. Pflüger's remarks, which comprise all that is known at present on its habits:—

"My friend Prof. Zuntz had the kindness, on my application, to make inquiries from the fisherman Noack in Coepenik, who for years has been collecting the large *R. esculenta* for physiological laboratories in this and foreign countries. The large 'species,' as it is called by Noack, lives chiefly in the lakes of the Upper Spree and in lake-like expansions of its affluents. It is not found in marshes. The smaller 'species' occurs in great numbers in a small river near Coepenik. The two 'species' are seldom found together in the same place. Noack regards the large *R. esculenta* as a distinct 'species' because it is not only larger, darker, and not of so bright a green, but because its habitus is more elongate. Noack asserts that the larger kind spawns about a fortnight earlier than the smaller one. The spawning-time begins normally in the middle of May, but occurred this year (1882) several weeks in advance. It is so far certain that this year the small *R. esculenta* spawned in the milder climate of Bonn in the beginning of June, and the large *R. esculenta* in the colder climate of Berlin in the beginning of May. There was certainly not a single breeding couple of the latter to be found in Berlin in the beginning of June, as I found out to my regret"[1].

"For clearness' sake I propose to designate as 'Seefrosch' the large variety, which does not live in marshes but in the running water of the lake-like expansions of the Spree. As it is so well distinguished from the smaller race by its earlier spawning-time, its habitus, its skin, and its peculiar abode, that no specialist will confound it, it is very remarkable that the crossing-essays proved in every respect successful, thus affording so far no justification for making a new species"[2]. The author then relates his successful experiments of fecundation between the "Seefrosch," the eggs of which were ready to be laid on the 17th of May, 1883, and the smaller race from Bonn, the spawning of which commenced only on the 29th of the same month; and he concludes:—

"The artificial fecundation therefore affords no support to the

[1] Arch. f. Physiol. xxix. p. 67. [2] *L. c.* xxxii. p. 522.

specific separation of the 'Seefrosch,' and the small race of the green aquatic frog, or the blue and green varieties of the same, and the importance of the above result is increased by the fact that the spawning-seasons of the crossed races do not coincide."

The difference in the spawning-season is the important factor which permits the existence in the same locality of two forms so closely allied and yet so distinct, as no doubt occasions for inter-breeding must be extremely rare. Analogous instances are known in Botany, as my friend Prof. Errera kindly informs me, and the name 'Asyngamie' has been coined for them [1]. It is indeed a fact that a fortnight's interval in the breeding-time of the two races must constitute a very effectual obstacle. As far as my experience goes, the females get rid of their eggs within a very few days. Having received this spring, through the kindness of Dr. F. Müller, about 25 specimens of *R. esculenta* from Basle, all the females laid their eggs in the nights of May 29–30 and 30–31, save one which spawned two days later. When, on the 27th of May, 1884, I received from Noack 85 specimens of *R. ridibunda* and 41 of *R. esculenta*, I found that all the females of the former kind had done spawning, and the males gave no signs of breeding dispositions; whereas all the *R. esculenta* I opened were full of ova, and out of the few males I possessed, two actually seized hold of females of their kind. But I did not obtain any spawn.

4. Description of a new Species of *Icterus*. By P. L. Sclater, M.A., Ph.D., F.R.S., Secretary to the Society.

[Received June 11, 1885.]

While engaged in the determination of the specimens of Icteridæ in the British Museum of Natural History, I have found amongst them a single skin of a typical *Icterus*, formerly in Mr. Gould's collection, which appears to belong to an unrecognized species. I propose to name it after the well-known collector so long resident on the Upper Amazons, by whom it was originally procured.

Icterus hauxwelli, sp. nov.

Flavissimus, aurantiaco tinctus: loris et capitis lateribus, cum gutture toto usque ad medium pectus, interscapulio angusto, alis et cauda nigerrimis: alis macula in secondariis alba ornatis: subalaribus flavis: rostro et pedibus nigris. Long. tota 8·5, *alæ* 3·75, *caudæ* 3·7.

Hab. Amazonia Superior; Chamicuros (*Hauxwell*).

Mus. Brit.

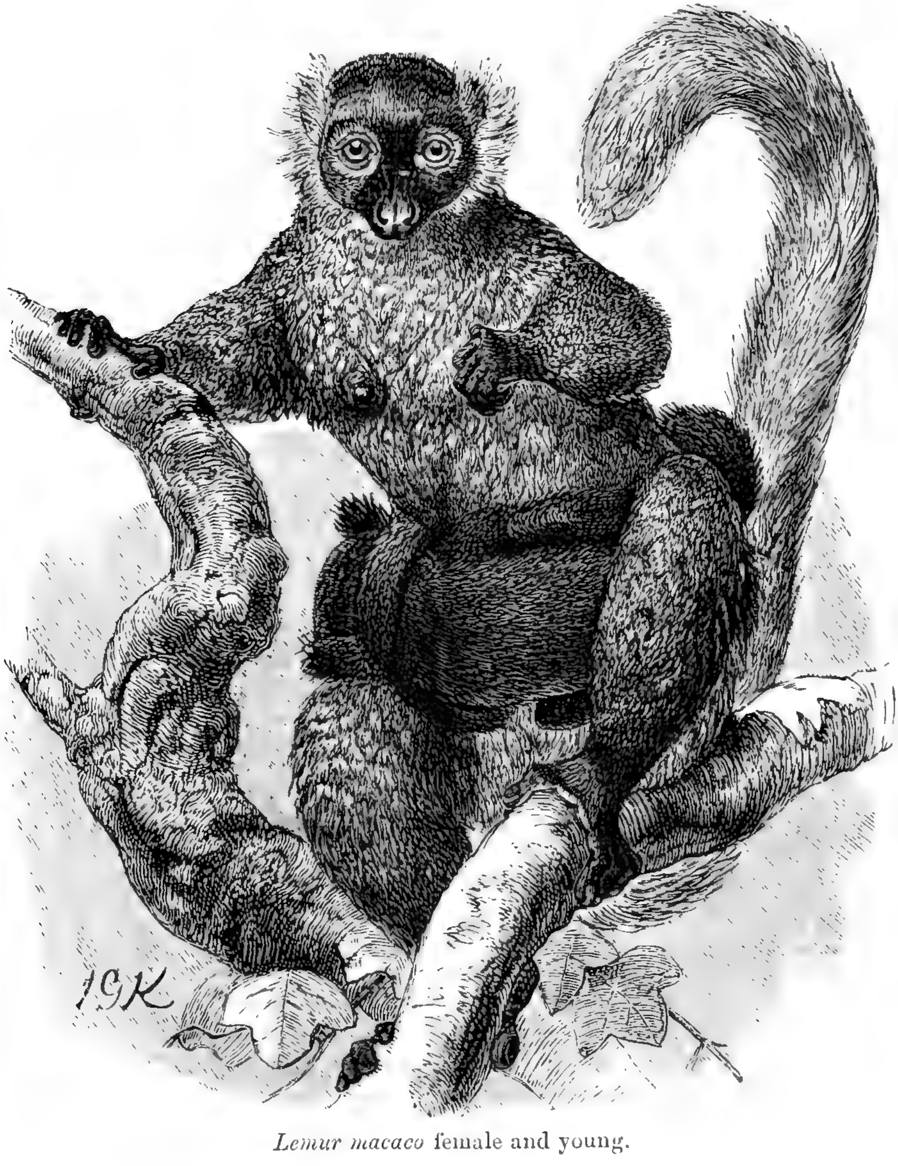
Obs. Species macula alari alba *I. grace-annæ* proxima, sed cauda tota nigra sanè diversa.

[1] *Cf.* A. Kerner, Vorläufige Mittheilung über die Bedeutung der Asyngamie für die Entstehung neuer Arten: Innsbruck, 1874. This paper is unfortunately only known to me through the abstract in the Botan. Jahresber. for 1874, p. 903.

5. Note on *Lemur macaco*, and the way in which it carries its Young. By P. L. Sclater, M.A., Ph.D., F.R.S., Secretary to the Society.

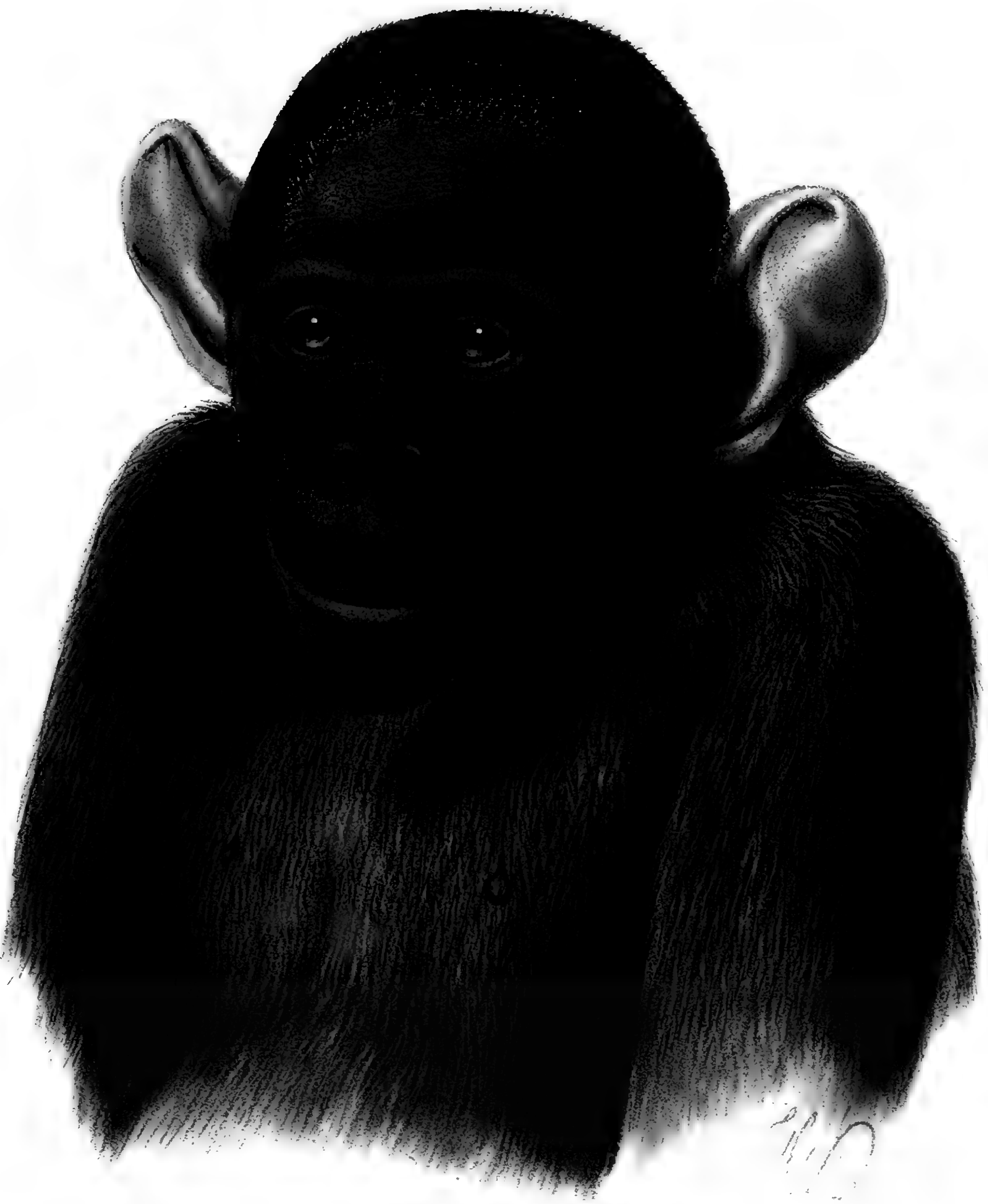
[Received June 12, 1885.]

It is now well known that the White-whiskered Lemur (*Lemur leucomystax*, P. Z. S. 1880, p. 451; P. Z. S. 1862, p. 347, pl. xli.) is the female of the Black Lemur (*Lemur macaco*). For the last few years we have had pairs of this species living together in the Society's Gardens. The female of a pair of Black Lemurs purchased of Mr. A. H. Jamrach on the 1st August, 1882 (sp. no. 116 of



Lemur macaco female and young.

P. Z. S. 1860. Pl. XIII.



TROGLODYTES CALVUS

Cat. of Animals 1883, p. 41), produced a young one on the 23rd March, 1884. It was a female, and of a brown colour like the mother. This specimen is now adult in the Society's collection, and has been placed in company with another male.

The same old female produced a second young one of the male sex on the 3rd April, 1885, which was black when born like the male parent.

Of the old female and this second young one, I now exhibit a sketch by Mr. Keulemans showing the curious way in which the young Lemur is carried by the mother. As will be observed, it lies nearly transversely across the belly of its mother, and passing its long tail round her back and so on to its own neck, uses it as a prehensile organ to hold on by.

On referring to Schlegel and Pollen's 'Fauna of Madagascar' it will be seen that they have figured the White-whiskered Lemur (plate i.) with its black young one and recognized the distinction in colour of the sexes throughout all ages. But so far as we can tell from observations made on these animals in captivity, the position which they have assigned to the young Lemur on the back of its mother is erroneous.

6. On a Female Chimpanzee now living in the Society's Gardens. By A. D. Bartlett, Superintendent of the Society's Gardens.

[Received June 15, 1885.]

(Plate XLI.)

Having paid considerable attention to the Anthropoid Apes, and from the opportunities I have had of seeing a very large number of living and dead specimens, not only in England but at the different Zoological Gardens, Menageries, and Museums, I have arrived at the conclusion that my acquaintance with them is sufficient to enable me to offer a few remarks upon an example now living in the Society's Gardens. This animal was purchased in Liverpool, Oct. 24, 1883, together with an adult male of the well-known Chimpanzee. When received she was quite immature, not having shed any of her sucking-teeth. At that time, however, she exhibited many well-marked characters, differing much from the well-known Common Chimpanzee; and as she advances towards the adult condition these differences are becoming more fully developed, and thus render a description of them less difficult.

In the first place I may remark the colour of the face, hands, and feet in the Chimpanzee are *white* or *pale flesh-colour*; the same parts of the animal under consideration are *black* or *brownish black*. Another well-marked difference is to be observed in the hair upon the head and face. In the Chimpanzee the hair on the top of the head, and passing down from the centre (where it divides) to the sides of the face or cheeks, is tolerably long and full, forming what may be considered rather bushy whiskers; whereas the figure before you (Plate XLI.) clearly shows the front, top, and sides of the head and face to be nearly naked, having only a few short hairs on the head, quite destitute of any signs of the parting so very conspicuous in the Chimpanzee. Another striking difference may be noticed in the size and form of the head and ears. Out of the number of Chimpanzees I have seen and examined, both old and young, none have possessed the large flat ears so conspicuous in this individual. The form of the head, the expression of the face, the expanded nostrils, the thicker lips, especially the lower lip, together with the more elevated skull, cannot fail to distinguish this animal from the Chimpanzee. There are other external characters that I pass over, as they require to be described anatomically. Again the habits of this animal differ entirely from those of the well-known or Common Chimpanzee. She has always shown a disposition to live upon animal food. Soon after her arrival, I found she would kill and eat small birds, seizing them by the neck, she would bite off the head and eat the bird—skin, feathers, and all; for some months she killed and ate a small pigeon every night. After a time we supplied her with cooked mutton and beef-tea; upon this food she has done well. I have never found any ordinary Chimpanzee that would eat any kind of flesh.

Another singular habit was the producing pellets or "quids," resembling the castings thrown up by Raptorial birds; I have here a few of them, taken from her mouth. They are composed of feathers and other indigestible substances, that had been taken with her food. Moreover she is an expert rat-catcher, and has caught and killed many rats that had entered her cage during the night. Her intelligence is far above that of the ordinary Chimpanzee. With but little trouble she can be taught to do many things that require the exercise of considerable thought and understanding: she recognizes those who have made her acquaintance, and pays marked attention to men of colour, by uttering a loud cry of *bon, bun, bun.* She is never tired of romping and playing, and is generally in a good temper.

I have no doubt but that M. du Chaillu obtained specimens of this animal; for I perfectly recollect seeing in his possession some damaged skins the heads of which were quite bald, that is destitute of hair; but his statements were so vague that it was impossible to say to what species he attached the different names he used. I am therefore, I think, justified in regarding the animal in question as distinct from the well-known or Common Chimpanzee; and as the term *Troglodytes calvus* implies a bald-headed animal it appears to me that the animal under consideration is fully entitled to its application.

Since writing the above I have examined the specimens in the British Museum obtained from M. du Chaillu, and, notwithstanding the shrivelled condition of the face and ears, I am perfectly satisfied of the identity of this specimen with the animal under consideration.

Another consideration is, however, forced upon me, with reference to this subject, and, to give an illustration, I may ask you for a moment to call to mind a fable of the Monkey who had seen the world. Now, supposing the Monkey to have been a collector of animals, and in Europe to have obtained some *white people with red or fair hair*, and upon his arrival in Africa to have met with the Negroes *black as jet*, with *flat noses, thick lips, and black woolly heads*, I think he would have been justified in regarding them as a very well-marked and distinct species. We are, however, in a position better able to understand that *time, climate, food*, and other *circumstances* may so change the condition and appearance that the original type may be said to have disappeared altogether. I venture to say this change is now taking place, however slowly it may be. It is noticeable in America, and doubtless in a few generations (without fresh arrivals of Europeans) the descendants of Europeans are gradually developing the peculiarities of the original natives of that country.

In conclusion I feel it is necessary to offer a few words in defence of naming animals that are nearly allied and calling them by new names, in order to constitute them as species. This practice has of late received a check; and it appears to me a very reasonable and proper mode of treating the subject to consider a large number of the animals that exhibit a few trifling differences to be only local varieties of the same species. At the same time we must bear in mind that in order to do this we should seek for intermediate forms or individuals that may be regarded as uniting two extremely different creatures. In the present instance I have failed to find any animal showing this tendency to be intermediate between this animal and the well-known Chimpanzee.

7. Remarks on *Ovis nivicola*. By F. H. H. Guillemard, M.A., M.D., F.L.S., F.Z.S., &c.

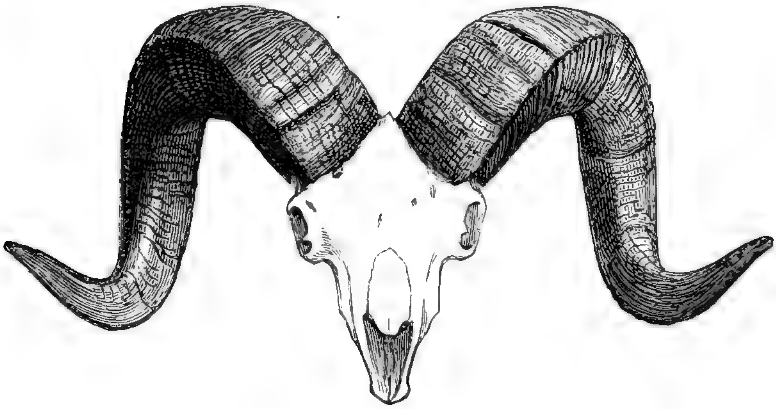
[Received June 16, 1885.]

The few notes I have on the habits and structural peculiarities of the Kamschatkan Wild Sheep, *Ovis nivicola*, Eschscholtz, a series of the skulls of which I have the honour of exhibiting, may possibly be of interest.

In the beginning of August 1882, Mr. Kettlewell's yacht 'Marchesa' arrived in Petropaulovsky, and shortly afterwards a small party, of which I was a member, started on an expedition through the centre of the peninsula, and, striking the great Kamschatka River near its source, descended it a distance of 450 miles to the sea. Our land journey led us through more or less mountainous country, and we had hoped to obtain information concerning Big-horn at Gunol, a little settlement of cross-bred Siberians and Kamschatdales, in the centre of the southern part of the peninsula. Near this place is a small range of low mountains, bare and rocky, about three or four thousand feet in height, the summits only of which were covered with snow. We were informed that there were a few Sheep here, but that it was very difficult to get them except in winter. As our time was limited, our chances of obtaining them were not considered promising enough to stop. Narcheeki also, in the Bolcheresk valley, was mentioned to us as another locality, a fact we were ourselves able to verify, as the natives had killed a young male only a few days previous to our arrival.

On reaching the neighbourhood of the magnificent volcanoes which guard the lower part of the Great Kamschatka River, I again made inquiries as to the existence of *Ovis nivicola* on their slopes, but was told that there were none. I cannot vouch, however, for the truth of the statement, as the natives live in superstitious awe of the mountains, and have never ascended them to any height. We had thus traversed the country without obtaining a single specimen; and we should have returned empty-handed had it not been for a Russian sable hunter accompanying our expedition, who informed us

Fig. 1.



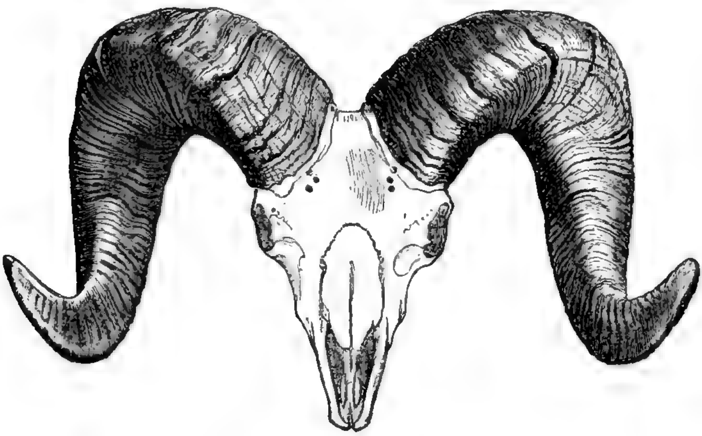
Head of *Ovis nivicola.*

that he had seen and shot several on the sea-cliffs of the east coast, some fifty miles E.N.E. of Petropaulovsky. On our return voyage from Behring Island we accordingly shaped our course for this spot; and on nearing the land we could distinctly make out small herds of the animals of which we were in search on the slopes of the cliffs, which here rose to a height of five or six hundred feet. Finding a good anchorage we at once arranged to stay, and in two days we brought to bag no less than thirteen individuals, all of which were full-grown males.

The general colour of the Kamschatkan Wild Sheep is a brownish grey, and the hair of those obtained by us at the end of the month of September was very long and thick. The head and neck are more distinctly grey than the rest of the body. Forehead with an ill-marked darker patch; upper and under lip greyish white. Anterior aspect of the limbs dark glossy brown; a line running down posterior aspect white. Tail short, dark brown; centre of belly and rump white; this colour does not surround the tail. The ears are remarkably short.

Sir Victor and Mr. Basil Brooke, in their article on Asiatic Sheep (P. Z. S. 1875, p. 509), remark on the resemblance of the horns of this species to those of *O. montana*, with which latter it has indeed, by some naturalists, been regarded as identical. But, as will be seen by the annexed illustrations, the uniformly smaller size of the head, the shortness and great breadth of the skull in its anterior aspect, the slight development of the præorbital fossæ, and the protuberance

Fig. 2.



Head of *Ovis montana.*

of the orbit itself serve to distinguish markedly the Kamschatkan Sheep from that of America.

The horns are less rugose than those of *O. montana*. The frontal surface is convex; the orbital surface at first concave, then flat, thus causing the fronto-orbital edge to be very sharp. The nuchal surface is convex and afterwards flattened; and the two remaining edges are rounded.

The following are the measurements obtained from a series of nine skulls:—

	Ovis nivicola.									*Ovis montana.*	
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Length of skull............	10½	10½	9¾	10¼	10¾	9¾	10½	10¼	...	11	13½
Breadth between orbits	5¾	5¾	4¾	5½	5¾	5½	5½	5¼	...	4¾	6
Length of horns round curve	35	34¾	24	32¼	35½	38	32½	26½	35	...	43
Circumference of horns at base	13¼	14½	13	14	14	13½	13¾	12½	13¼	...	...
Horns from tip to tip ...	21	25	17½	21	26½	26	22½	21½	25½	...	...

Measurements in the flesh of the thirteen individuals obtained were also taken, and are as follows :—

Supposed age (yrs.)...	3	3	5	5	5	5	5	6	6	6	6?	6	6
	in.	in.	in.	in.	in.	in.		in.	in.	in.	in.	in.	in.
Extreme length.........	65½	63	62	64	64	66	...	66	65	66	66	67	67
Greatest girth	53	53	56	54	55	...	...	56½	...	54	53	54	55
Height at shoulder ...	38	39	38	39½	37	...	...	40	41	40	37	40½	39

The above measurements are in English inches.

The animals seemed to confine themselves to the precipitous slopes of the sea-cliffs, and were in small herds of from three to nine individuals, all of which apparently were males between the ages of three and six years. As in the case of other Wild Sheep, the females and young males doubtless keep apart; but we were not fortunate enough to discover their habitat, neither could we obtain any information about them from the natives.

I regret to say that the two skeletons we prepared were lost during a typhoon encountered by the 'Marchesa' in the China seas on her return voyage.

8. On the Geographical Races of the Rocky-Mountain Bighorn. By Lieut.-Col. John Biddulph, F.Z.S.

[Received June 16, 1885.]

In the 'Proceedings of the United-States National Museum' for last year, Mr. Nelson has given the name of *Ovis montana dalli* to the Wild Sheep of Alaska, which he describes as a new geographical race of the Bighorn of the Rocky Mountains. Mr. Nelson relates that he saw two individuals in a wild state, and many hundreds of skins of the species, while he was in Alaska. He states that it inhabits suitable localities all over Alaska and in British North America. Few details of description are given in the paper, but a fuller account is promised in a general list of Alaskan Mammals now in course of preparation. Beyond stating that it is of a uniform dirty-white colour, so that the posterior disk is indistinguishable, and that its horns are smaller, Mr. Nelson points out no differences between specimens of the Alaskan species or variety and specimens from the United States.

Having devoted some time to studying the Wild Sheep both of Asia and America, I had noticed the fact that there are two distinct types to be distinguished among the North-American Wild Sheep before I had seen Mr. Nelson's paper; but I will not at present go so far as to say that they constitute two distinct species.

The Wild Sheep are so puzzling a group, and slight variations in colour and horn are so common among individuals from the same locality, that it is difficult sometimes to define different species. Specimens from the extreme north of the Rocky Mountains differ, however, so greatly from those procured in the United States, as to deserve future specific distinction, unless specimens from intermediate localities can be found to connect the two.

All naturalists who have studied the Ovine group are aware of the confusion that has been caused in discriminating species, partly through want of accuracy in noting the exact localities whence specimens have been procured, and partly by the impossibility of collecting together for comparison a sufficient number of specimens. It was Mr. Seebohm, I think, who once classified naturalists as "lumpers" and "splitters." The Wild Sheep have suffered severely from both classes. Buffon and Pennant mention the Wild Sheep of Corsica, Sardinia, Tartary, Siberia, Kamtschatka, and California as varieties of the Mouflon. Schreber, under the specific name of *Ægoceros argali*, lumps up together the North-American, Siberian, and Thibetan Wild Sheep. Even so late as 1871, Blyth, writing to the 'Field' under the name of "Zoophilus," failed to distinguish between the Rocky-Mountain species and the Kamtschatkan species, *O. nivicola.* In the way of splitting, the Rocky-Mountain Bighorn, of which only one species has been recognized, had no less than five specific names given to it between 1803 and 1830.

That there may be substantial grounds for separating the northern Bighorn from the southern species is shown by the difficulties that have been experienced by the British-Museum authorities in naming the North-American specimens now in their possession.

Among the stuffed specimens exposed to public inspection are two from North America: the one from the Yellowstone River is labelled *canadensis,* which is the correct specific name of the Rocky-Mountain Sheep, supposing only one species to exist ; and the other, from Liard's River, is labelled *nivicola* or *the Alaskan Wild Sheep*, though the true *O. nivicola* is not found in America. In a corner of the same case is a specimen of *O. nivicola* from Kamtschatka without any name on its label. There is also stowed away in one of the basement rooms a stuffed specimen in bad preservation, labelled *canadensis.* This is the specimen described and figured by Richardson in the 'Fauna Boreali-Americana,' and is identified by Mr. Nelson as belonging to the new variety which he has named after Mr. Dall. It is of the same type or race as the specimen from Liard's River, but is in its summer coat, whilst Dr. Rae's specimen is in its spring or winter coat. Comparison of these specimens will show how those from Alaska and British North America came to be classed as *O. nivicola.*

In a paper published in the Society's 'Proceedings' for 1875 by Sir V. Brooke and his brother on the large Wild Sheep of Asia, it was pointed out that *O. nivicola* differs from the Bighorn in the shortness of its face and its great proportionate breadth across the orbits. There is another equally noticeable point of distinction in the colour of the hind quarters.

Both types of the North-American Sheep have a large dirty-white posterior disk, which is very conspicuous except in the old males in summer, when the whole of the body becomes nearly white; they have also a dorsal stripe, which is more or less conspicuous. In *O. nivicola* there is no disk showing above the tail [1], though the posteriors are white and the dorsal stripe is wanting. There are other characteristics in which *O. nivicola* differs from the southern race of the Bighorn, but which it shares with the northern race. In all three the horn is smoother, less wrinkled, and more goat-like in character than in other known species of true Wild Sheep; but both *O. nivicola* and the northern race of the Bighorn have the horns less massive, and in both the points turn out abruptly, so that the tips are sharp and seldom broken, and point outwards; while the southern race of Bighorn has the horns massive at the base, the tips blunt, generally broken, and pointing forwards.

The ears in *O. nivicola* are very small and rounded, giving the idea that they have been cut, and are thickly furred to the edges. In the northern race of Bighorn the ears are also small and thickly furred, but have blunt points instead of being rounded. In the southern race of Bighorn the ears are broad, pointed, and deer-like, moderately coated with hair, and are, if anything, rather larger than in any of the known species of Asiatic Argali, measuring in the dried skin fully an inch longer than those of the northern race. Another point of distinction between the two races of Bighorn is in the size of the skull, the southern race having a skull averaging from an inch to an inch and a half longer, and from half an inch to one inch broader than the northern race. There are also considerable apparent differences in colour between the two races of Bighorn; but I have not been able to examine a sufficient number of specimens to be sure how far these differences are constant. I have failed to find any specimens of the southern race with the dark winter coat like the specimen from Liard's River, nor can I find any mention of their ever assuming it. There appear to be also slight differences in the distribution of the colour on the legs. The northern race also has the hair between the ears at the back of the horns growing into a long curly tuft, which also happens in *O. nivicola,* but not in the southern race of Bighorn.

The subjoined table contains some comparative measurements of specimens of the heads of the two races of the Bighorn.

[1] This is clearly shown in Eschscholtz's figure of *O. nivicola* (Zool. Atlas).

	Bighorn. Southern Race.			Bighorn. Northern Race.	
	Stuffed heads killed in Wyoming, about 44° 30′ N. lat.		Skull in Osteological Gallery in Brit. Mus. Locality unknown.	Stuffed specimen in Brit. Mus. from Liard's River, about lat. 59°.	Stuffed specimen in Brit. Mus. figured by Richardson, killed about lat. 62°.
Length of horn, measured round fronto-nuchal curve	in. 40·65	in. 33·25	in. 38·25	in. 32·2	in. 32·1
Circumference at base	16	16	16·25	11·8	13
Length of face from supra-occipital edge to end of præmaxillaries	12	12	11·75	10·5	10·6
Breadth over orbits	8	7·5	7·25	7	7
Apparent age..................	11 yrs.	11 yrs.	8 yrs.	8 yrs.	7 or 8 yrs.

The American Bighorns have a wide range. They are found along the whole course of the Rocky Mountains, both on their eastern and western slopes, as far south as Sonora and New Mexico, about lat. 31° (*Schott*), and extending to the furthest northern point of suitable ground to lat. 68° (*Audubon*). They are also found in the lesser mountain-chains extending from British Columbia to California along the eastern Pacific Coast (*Baird*), and in Alaska (*Dall*). It will not therefore be strange if more than one species should be proved to exist. Further evidence is needed to show where the northern race or species has its southernmost limit, and to which the original specific name *canadensis* was applied. Specimens from the Yellowstone River have somewhat less massive horns than those from Wyoming and Colorado, but in other respects belong to the southern race. Baird also figures the horns of a specimen from California, on the 35th parallel of latitude, which measure only thirteen inches in circumference at the base, and apparently approximate in character to those of the northern race.

As some confusion exists as to the names already applied to the Bighorn, it may be useful to give an account of the most important references to it. The earliest notice is to be found in the account of California by Father Picolo, one of the first Catholic missionaries who visited that country in 1697 (Abridg. Phil. Trans. London, vol. v. p. 459). He describes it as a sort of Deer. "It is as large as a calf of one or two years old; its head is much like that of a Stag; its horns, which are very large, like those of a Ram; its tail and hair are speckled and shorter than a Stag's, but its hoof is large, round, and cleft as an Ox's. Their flesh is very tender and delicious." It is also mentioned by other Spanish writers on California of that period. The species then appears to have been lost sight of by naturalists of the 18th century. The only one to allude to it was Pennant, who, as I have already mentioned, calls it a variety of Mouflon. In November 1800, an adventurous Scotchman, named MacGillivray, exploring in the Rocky Mountains along the Bow River, killed several in lat. 50°. He had apparently never heard of the animal before, and found little difficulty in shooting them. In 1803 MacGillivray's account was published, with a woodcut, by Dr. Mitchill, in the 'New York Medical Repository.' A specimen procured by MacGillivray was given at the same time to the New-York Museum. In the same year a description, transcribed from the New-York account, was published in Paris by E. Geoffroy de St.-Hilaire, with a woodcut from a drawing of the New-York specimen. The cut is almost identical with the one published in New York, but is larger. No name beyond that of *Bélier de montaigne* is assigned to it by Geoffroy.

In or about 1804 an account of the species was published in vol. xv. of Shaw's 'Naturalist's Miscellany,' with a figure and the name of *Ovis canadensis*. The figure is coloured, but with this exception and the addition of a background it is scarcely to be distinguished from a reversed copy of Geoffroy's figure. Shaw, however, mentions that a specimen is in the British Museum, and makes no allusion to MacGillivray, so that it would appear that he was ignorant of the New-York publication. The exact date of Shaw's publication cannot be verified. There are twenty-four volumes in the series, the first of which was published in 1790, and the last in 1813, but the intermediate volumes are not dated. It is fair to suppose that one volume was published every year, and that the fifteenth was published in 1804. In 1817 Cuvier mentions it as "probably a kind of Argali that had crossed on the ice from Asia," under the name of *Ovis montana*, and refers to a figure by Schreber. Schreber's work was not published till 1836, but some of the plates were issued earlier. The work contains two figures of *O. montana*, one of them being a coloured copy of Richardson's figure in the 'Fauna Boreali-Americana,' which was published after Cuvier's work; it is therefore evidently the former figure, which is only a reproduction of Geoffroy's, to which Cuvier refers. It is impossible to say by whom the specific name of *montana* was first conferred on this Sheep. It is assigned by different writers to Geoffroy, Cuvier, and Desmarest; but the name appears to have been used by Schreber before either of the two latter, and is assigned by him to Geoffroy. From other references it would appear that the name has been erroneously assigned to Geoffroy, and was probably first employed by Schreber for Geoffroy's figure, the date of Schreber's republication of which is unknown, Geoffroy's name being turned into Latin. In 1818, Desmarest, referring to MacGillivray's account, gave the specific name *cervina* to the Bighorn. But in his 'Mammalogie,' published two years later, he suppressed the name and returned to that of *montana*, which he also ascribes to Geoffroy, whose figure he again reproduces. In 1827 Hamilton Smith gave the name of *pygargus* to the Rocky-Mountain Sheep. The accompanying figure is certainly of the southern or heavy-horned species, but he gives no information about the animal. In 1829 Douglas gave the name of *californianus* to the Wild Sheep that inhabits "the subalpine region of Mount's Wood, St. Helens, and Vancouver, but is more numerous in the mountainous districts in the interior of California." He gives very exact measurements, one of which assigns a length of eighteen inches to the tail; but as he states that he never saw one alive, but founded his species on one good skin seen "about the great falls of the Columbia River," and as no species of Wild Sheep yet identified is known to have a tail approaching to this length, the name cannot stand. In the work on the Natural History of Central America now in course of publication by Messrs. Godman and Salvin, Mr. Alston has restored Desmarest's name of *cervina*, on the ground that the name of *montana*, which he assigns to Cuvier, was applied to the Rocky-Mountain Goat before Cuvier wrote. There appears no reason why the same specific name should not be used in both genera; but as Shaw's name of *canadensis* was published long before Cuvier wrote, and before there is any proof of the name *montana* having been used by Geoffroy or by Schreber, it must have priority.

The local name of Taye, which is sometimes given to museum specimens, is taken from MacGillivray's original account, and is apparently a misprint for Tajé, which, according to Schott, in the U. S. Mexican Boundary Report, is the name used for the Bighorn by an Indian tribe in California. There appear to be no good reason for retaining so purely local a name. "My-attic" and "Ema-ki-canow" are also mentioned by MacGillivray as Indian names for the Bighorn.

The most important references to the Bighorn are as follows:—

1803. *Mountain Ram of North America*, Mitchill, New York Repository, p. 237 (fig.).

1803. *Bélier de Montaigne*, E. Geoffroy de St.-Hilaire, Annales du Musée d'Histoire Naturelle, tom. ii. p. 360 (fig.).

1804. *Ovis canadensis*, Shaw, Naturalist's Miscellany, vol. xv. (fig.).

1817. *O. montana*, Cuvier, Règne Animal, tom. i. p. 267.

1818. *O. cervina*, Desmarest, Nouveau Dictionnaire d'Histoire Naturelle, vol. xxi. p. 553.

1820. *O. montana*, Desmarest, Mammalogie, p. 487 (fig.).

1827. *O. pygargus*, Hamilton Smith, Cuvier's Animal Kingdom (fig.).

1829. *O. californianus*, Douglas, Zoological Journal, vol. iv. p. 332.

1829. *O. montana*, Richardson, Fauna Boreali-Americana (fig.).

1836. *Der Amerikanische Argali*, Schreber, Die Säugthiere, vol. v. p. 1367 (2 figs.).

1840. *O. montana*, Blyth, Proc. Zool. Soc. 1840, p. 77.
1840. *O. californiana*, Blyth, *ibid.*
1851. *O. montana*, Audubon and Bachman (fig.).
1854. *O. montana*, Richardson, Voyage of H.M.S. 'Herald' (osteological fig.).
1857. *O. montana*, Baird, Mammals N. America, Survey Reports, p. 673 (fig. of horn).
1859. *O. montana*, Schott, U. S. Mexican Boundary Report, part ii. p. 52.
1871. *O. canadensis*, Blyth ("Zoophilus"), The Field, May 13 (fig.).
1880. *O. cervina*, Alston, Biologia Centr.-Am., Mammal. p. 111.
1884. *O. montana dalli*, Nelson, Proceedings of U. S. National Museum, vol. vii. p. 13.

9. On the Avian Sternum.

By Beatrice Lindsay, Girton College, Cambridge [1].

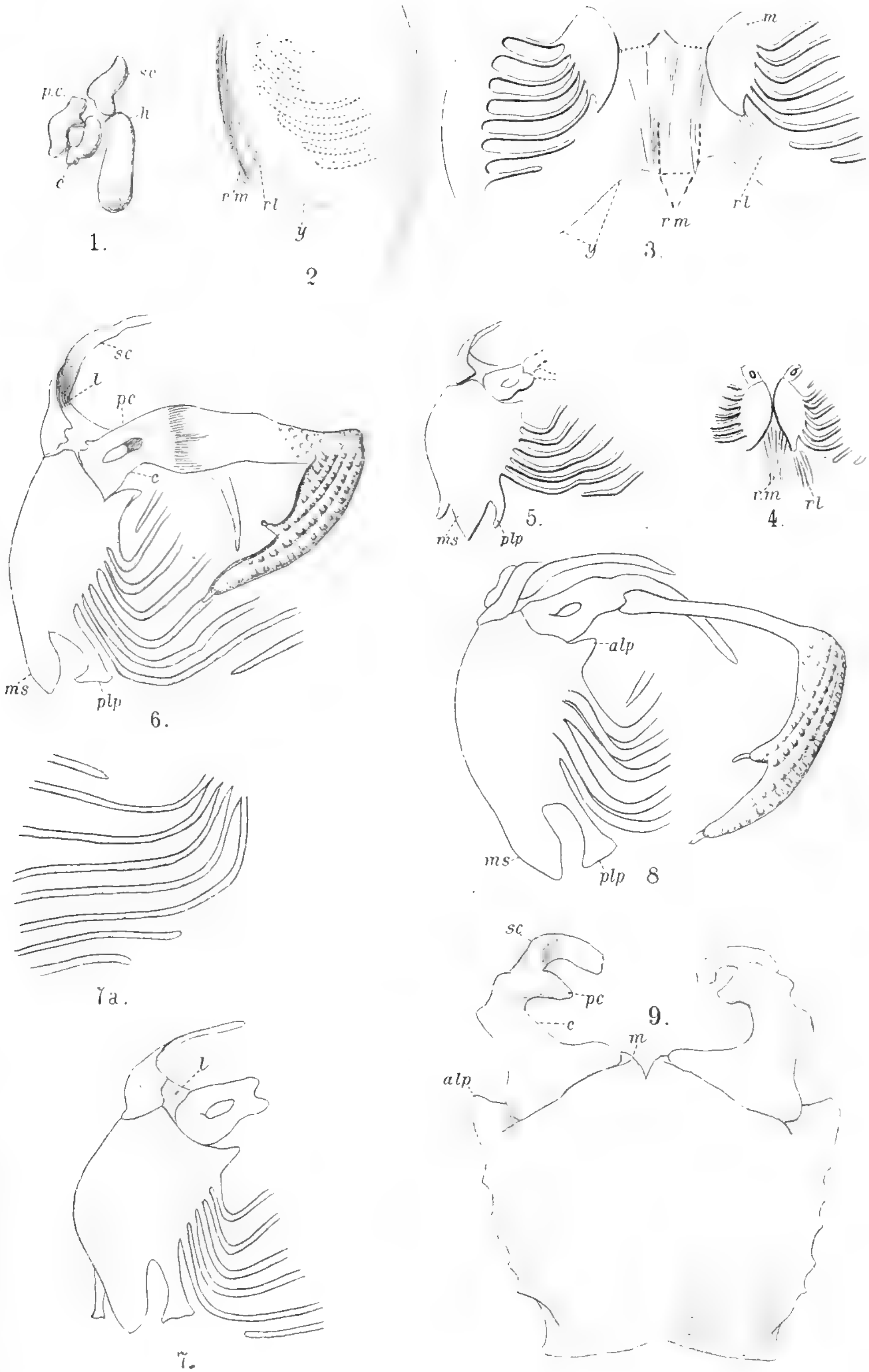
[Received June 16, 1885.]

(Plates XLII.–XLV.)

Introduction.

The most typical and simple form of the sternum is that found in Reptiles, where this bone, although associated with a shoulder-girdle of maximum complexity, and strengthened by the apposition of an interclavicle in the median line, is itself undoubtedly of homogeneous origin, that is to say derived solely from the fusion of ribs. In Birds and Mammals the sternum has been supposed by some authorities to be, on the contrary, a composite structure, containing a supplementary median element more or less distantly derived from membrane-bone, and homologous with the free T-shaped interclavicle of Reptiles. Much has been done to increase the plausibility of that theory by a vague use of the terms "interclavicle" and "episternum." These names, when first introduced, expressed nothing but a certain anatomical position of the parts to which they were applied; but now that the aforenamed reptilian structure is held by nearly all anatomists to be a membrane-bone, the names given to it inevitably tend to suggest a meaning restricted to particular homologies. But, unfortunately, many authors still apply the said names indiscriminately to any anterior median ossification, or paired ossification approaching the median line, without regard to its origin, whether known or unknown; and thus they unintentionally create factitious evidence for the above-named theory, by the continual implication of homologies which have never been satisfactorily proved. Instances in point are afforded by certain

[1] Communicated by Dr. H. Gadow, C.M.Z.S.



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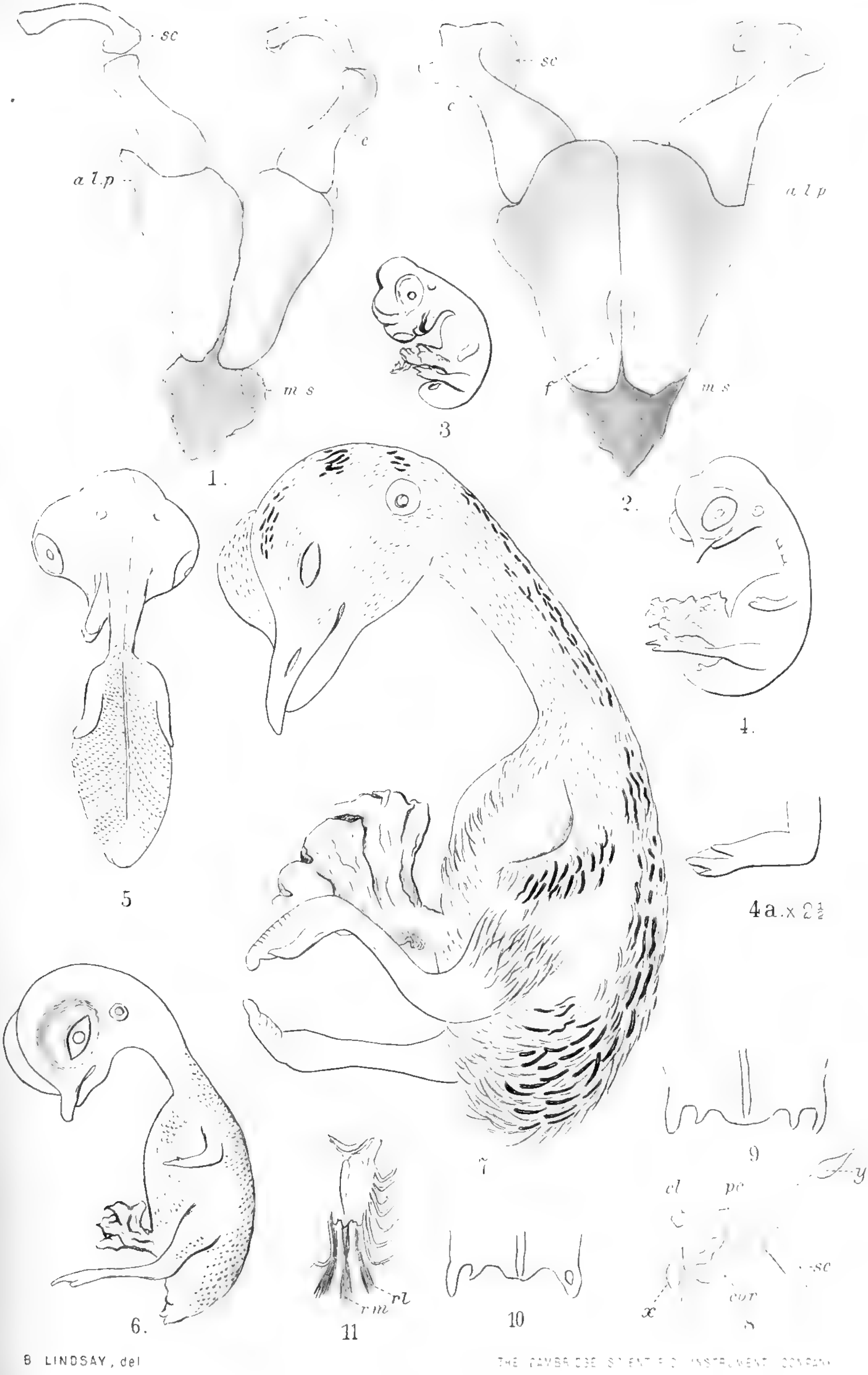
AVIAN STERNUM



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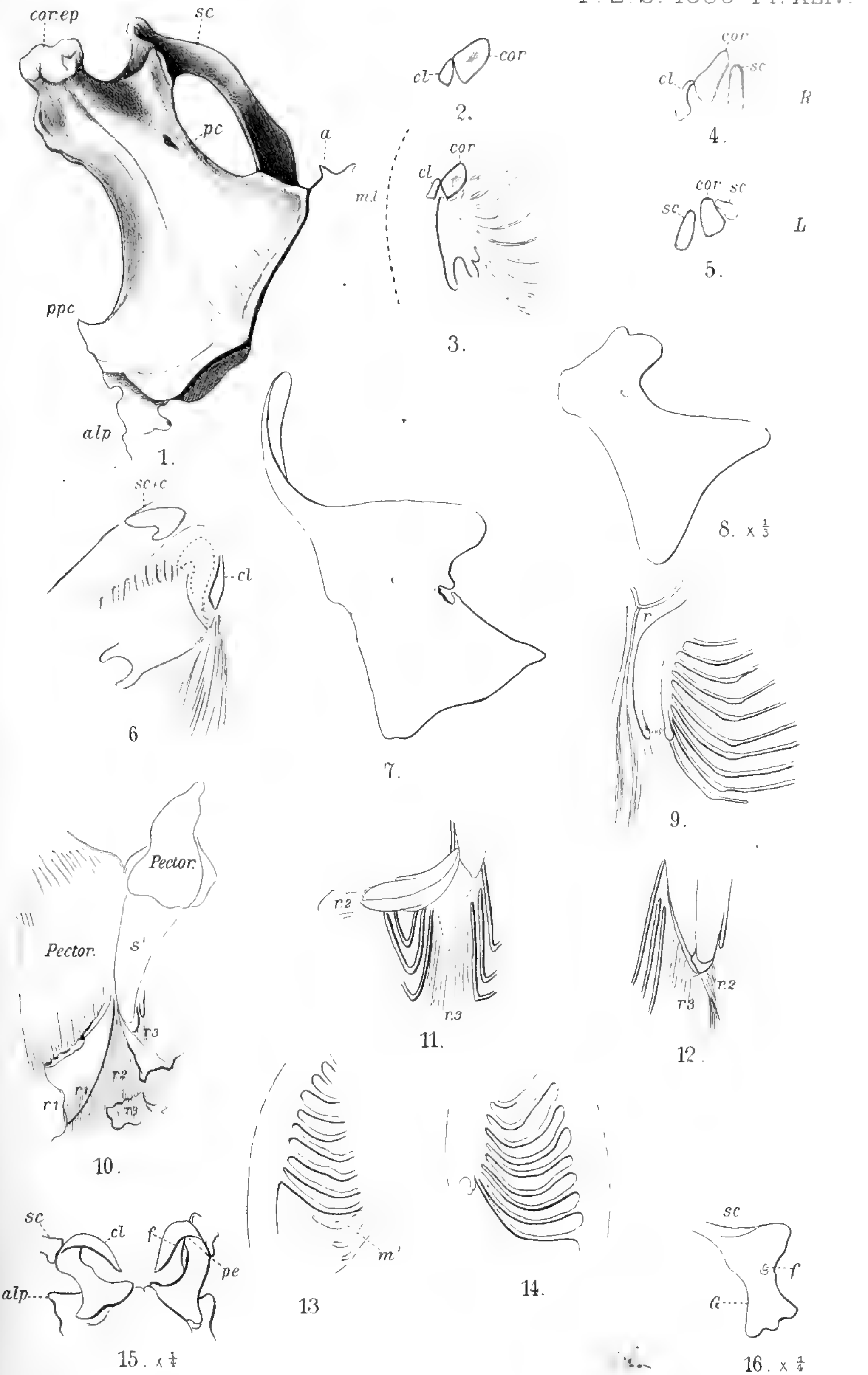
AVIAN STERNUM.



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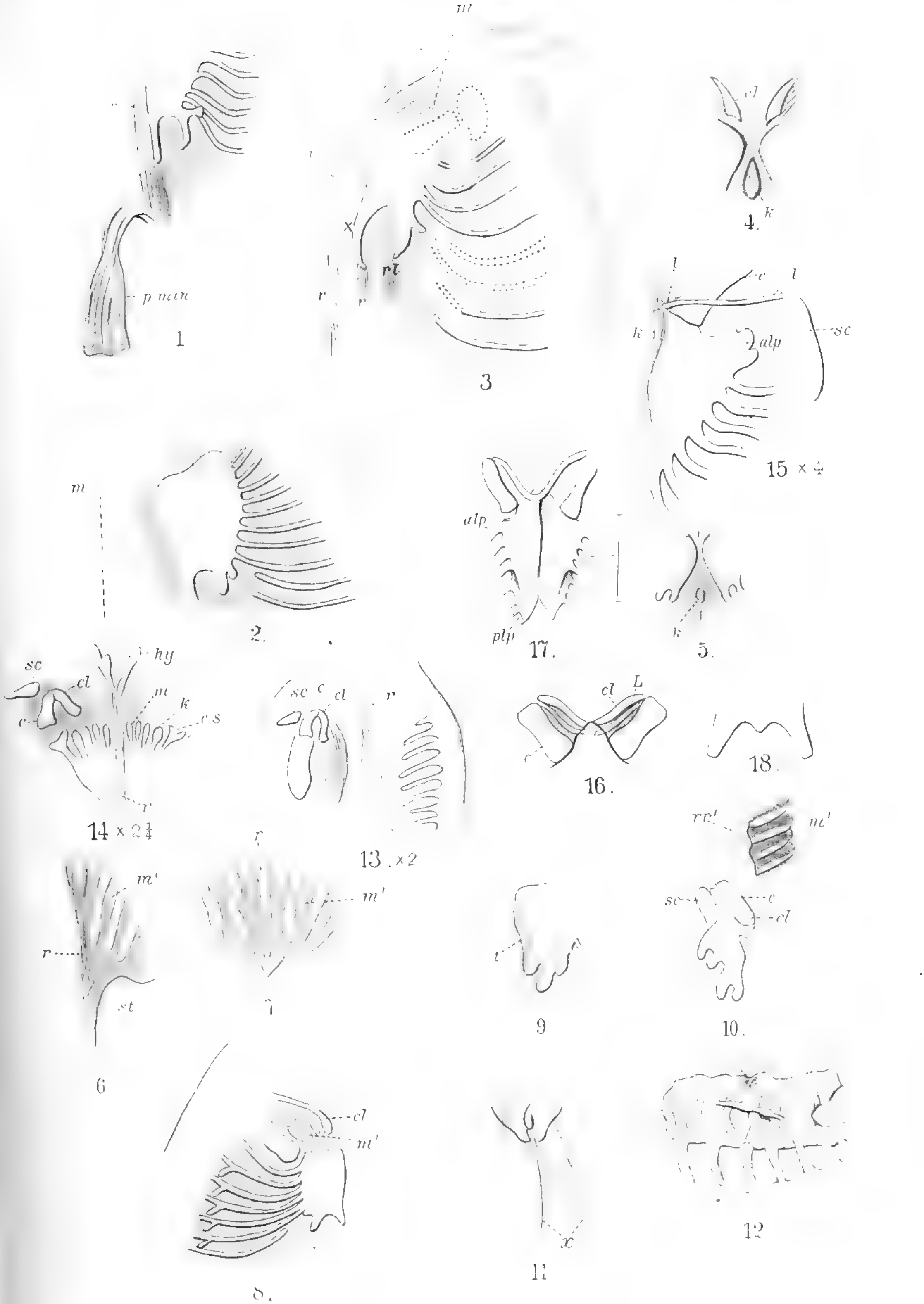
AVIAN STERNUM



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AVIAN STERNUM.

occasional centres of ossification in the human sternum, and by the median apophysis of the avian furcula.

So far as regards the sternum of the higher Mammalia, the balance of recent evidence is certainly not in favour of the theory under consideration. The costal origin of the manubrium sterni is asserted by Ruge on the ground of embryological evidence; while the complexity of its centres of ossification, so fully discussed by Prof. Albrecht in his recent paper on the human sternum, points to an origin from the fusion of many serial members, rather than from the differentiation of an interclavicle—a process, it may be added, which could have had no *raison d'être* in a bone placed under conditions involving comparatively little mechanical strain. With regard to the avian sternum, on the contrary, no recent evidence has been offered in opposition to the theory maintained by Götte and Hoffmann, which asserts the presence of an interclavicular element united with the costal sternum, and forming the crista sterni or keel[1]. This theory will be examined from a critical point of view in the following communication, the object of which is to discuss the origin of the avian sternum and its various parts.

The communication consists of three sections, arranged in the following order:—

Part I. (i.) Statement of the chief views held as to the nature of the Avian Sternum, and of the nomenclature of its parts adopted by the best authorities, where this offers any special peculiarity; (ii.) Comments on certain of the above views.

Part II. Details of the embryonic development of the sternum and adjacent parts in five types of bird (with Plates).

Part III. Summary of the conclusions apparently suggested by the latter, in connection with previously recorded facts.

[1] It should be added at the outset that no conclusion can be gained from the consideration of other types than birds; for while on the one hand we may refer to the keel of the sternum in Bats, which is admittedly the outgrowth of the sternum itself, belonging both to the presternum and mesosternum, yet on the other hand we must admit the existence in *Hatteria* of a keel formed by coalescence of the interclavicle with the sternum, and affording attachment to the pectoral muscles (see "Contributions to the Anatomy of *Hatteria*, or *Rhynchocephalus* of Owen," by A. Günther, M.A., Ph.D.: Phil. Trans. 1867, p. 595).

Part I.—(i.) Tabular Statement of the Theories held, *Facts adduced, and Nomenclature adopted by various Writers with regard to the* Avian Sternum.

Details are added with regard to such parts of the shoulder-girdle and its ligament as have been supposed to afford evidence with regard to the composition of the Sternum.

Theory.	Evidence adduced in support of Theory, and Nomenclature of Parts of Sternum, etc.
1. L'Herminier's view (date 1830).—That the Avian sternum consists typically of 9 ossifications in 3 rows.	*Evidence.*—Investigation of the ossifying sternum. *Nomenclature.*—The anterior row of centres of ossification consists of three parts—a median *prosternum* and two *prosternals*, constituting the *prosternum*. The intermediate row consists similarly of *mesosternum* and two *mesosternals*, constituting the *mesosternum*; and the posterior row of *metasternum* and two *metasternals*, constituting the *metasternum*. The centres which occur most frequently are the mesosternals, and in the Ostrich these alone exist.
2. C. G. Carus's view (date 1834).—That the middle portion of the episternum of Saurians is the equivalent of the crista sterni of Birds.	
3. Rathke's view (date 1853).—That in all types the sternum is costal in origin, while the development of the episternal ligament which unites it with the clavicles is perfectly independent.	*Evidence.*—Results of embryological investigation.
4. Harting's view (date 1864).—That the interclavicle is represented in Birds (both Ratitæ and Carinatæ) by the system of ligaments between sternum, coracoid, and clavicle, together with the processes to which they are attached.	*Evidence.*—Anatomical position in the adult of the system of ligaments described, together with that of the processes which frequently afford attachment to those ligaments, and occasional pathological ossifications in the ligaments themselves. *Nomenclature.*—Three parts of the said system of ligaments are distinguished, namely:—(i) *vertical median posterior* lamina of ligament; (ii) *vertical median* or *sterno-clavicular* ligament; and (iii) *lateral superior* paired lamina, or *coraco-clavicular* ligament. (i) and (ii) are included under Götte's "sterno-clavicular ligament," the distinction between them being that (i) has a lateral, and (ii) an anterio-posterior extension.

5. PARKER'S VIEW (date 1868).—That our present knowledge of the sternum does not justify any complete interpretation of the morphological value of its parts; that nevertheless the "lophosteon" may be regarded as a feature of Avian rather than pre-Avian date; and that the division of the sternum by fontanels or notches is due to a process of absorption, while their position marks the boundary of definite and important ossifications.	*Evidence.*—Comparison of adult forms and late stages of the young, for the most part after commencement of ossification. *Nomenclature.*—The sternum has three typical divisions in longitudinal succession, the *Prosternal*, *Mesosternal*, and *Xiphisternal*. The first is ossified by a paired centre called the *Proosteon* (existing in *Rhea*, &c.), the second by a paired *Pleurosteon*, and the third by the *Urosteon*, existing in rare cases (*Dicholophus*, e. g.). There also exists a less important division into three regions in transverse succession, viz. the *lateral* region, paired, the *intermediate* region, paired, and the *mesial*, which, though really paired, is apparently single. The last is ossified by a centre called the *Lophosteon*, corresponding with the keel. Besides the typical *Proosteon*, *Pleurosteon*, and *Lophosteon*, and the rare *Urosteon*, there are other centres of ossification, viz., the *Metosteon*, paired, existing behind the Pleurosteon in Crows and Gallinacea; and the *Coracosteon*, present on each side of the Lophosteon in *Turnix*. Of these the *Lophosteon*, *Urosteon*, and *Coracosteon* are centres solely ornithic; while the *Pleurosteon* is found paired in Reptiles, the *Metosteon* corresponds with the partial ossification of the posterior-lateral process in *Stellio* and *Iguana*, and the *Proosteon* is found in certain Mammals, either paired or single. The typical posterior processes of the sternum as seen in the Pheasant are named the *External Xiphoid*, *Intermediate Xiphoid*, and *Middle Xiphoid*. The last lies posterior to the keel, and has also been termed the *Entosternum* or *the middle xiphisternal process*. (*Note.*—The Pleurosteon is thus the equivalent of L'Herminier's lateral mesosternals, and the representative of the primitive costal halves of the sternum. The Proosteon, as existing in *Rhea*, I suppose to be the ossification of the anterior lateral process, whereof the gradual addition is traced in the Ostrich. Where it is absent, I imagine that this process is simply a degraded portion of the anterior part of the costal sternum. This view I derive from its condition in the chick, where this process, although in the adult it looks like a secondary addition, is ossified by the Pleurosteon, and has a primitive connection with anterior ribs, in the early embryo.)

TABULAR STATEMENT (*continued*).

THEORY.	EVIDENCE ADDUCED IN SUPPORT OF THEORY, AND NOMENCLATURE OF PARTS OF STERNUM, ETC.
6. HUXLEY'S VIEW (date 1871, 'Anatomy of Vertebrated Animals,' pp. 240, 248).—That the interclavicle is represented by the median part of the furcula, but that its occasional elongation into a process is a secondary addition, while the secondary character of its rare union with the keel is suggested by comparison of the union of the coracoid and clavicles in *Didus* and *Opisthocomus*; that the keel is quite independent of the interclavicle, and that the posterior processes of the sternum are formed in consequence of imperfect ossification, and are comparable with the division of the xiphoid process of Mammalia.	*Evidence.*—Comparison of adult forms and late stages of the young, after the commencement of ossification. *Nomenclature.*—The occasional anterior median process of the sternum is called the *rostrum* or *manubrium*, but no more important character than that of a mere outgrowth is claimed for it. The occasional median process of the "interclavicle" is called the *hypocleidium*, while the anterior lateral angles of the sternum, including part of the region which affords attachment to ribs, are called the *costal processes*. The rest of the nomenclature adopted is that of Prof. Parker.
7. GEGENBAUR'S VIEWS: (i.) (Date 1859).—That the costal sternum of Birds is supplemented by an element homologous with the Reptilian interclavicle, which forms the keel. This earlier view, which suggested the direction of Götte's researches, was afterwards abandoned. (ii.) (Date 1877, Elements of Comp. Anat. 2nd ed. Bell's transl., pp. 442, 443, 444).—That the keel is a process of the sternum, physiologically corresponding with that found in "aerial mammals," while the episternum is wholly absent; that the posterior processes are formed by the occurrence of fontanels; and that, as compared with the sternum of Reptiles, the sternum of Birds has suffered a diminution of its posterior length, this being indicated by the relatively small number of ribs attached to it.	
8. GÖTTE'S VIEW (date 1877).—The same as Gegenbaur's earlier view; also that the *sterno-clavicular* ligament forms an integral part of the interclavicular structure; further, that the keel + ligament is also homologous with the mammalian manubrium sterni.	*Evidence.*—Results of embryological investigations on chicks of 4 to 5 days' incubation, and on the conditions of commencing ossification in the median part of the furcula of chicks of 8 days' incubation.
9. HOFFMANN'S VIEW (date 1879).—The same as Götte's, regarding the nature of the keel.	*Evidence.*—Results of investigations as to the nature of the cartilaginous keel in several embryos, and of the sterno-clavicular ligament in young birds of several types.

The foregoing summary of theory with regard to the Avian Sternum would be incomplete without reference to the recent researches on the Mammalian Sternum which have been already mentioned, namely those of Ruge, which established the costal origin of the *xiphisternum* of man; and those of Albrecht, which have lately added more force to Ruge's conclusions as to the costal origin of the *manubrium sterni*. The result in the former case precludes us from admitting that the posterior processes of the avian sternum are, as suggested by Huxley, homologous with the xiphisternum of man [1]; and in both it greatly weakens the argument for the interclavicular homology of the keel, while at the same time it points out a line of research with regard to the anterior region of the avian sternum, which has been followed during the investigation hereafter described.

(ii.) Certain of the theories named call for some comment. Firstly, with regard to that of L'Herminier, it is obvious that at the date of his researches the phylogenetic value of anatomical features was but little understood; we are therefore not bound to accept L'Herminier's own estimation of the equal value of his three typical rows of ossific centres with the confidence which at first sight might seem due to his numerous facts and clear description of them. Nevertheless his record of the respective dates at which the various centres appear affords a valuable clue to the order of development of the respective parts, the details of which will be discussed hereafter.

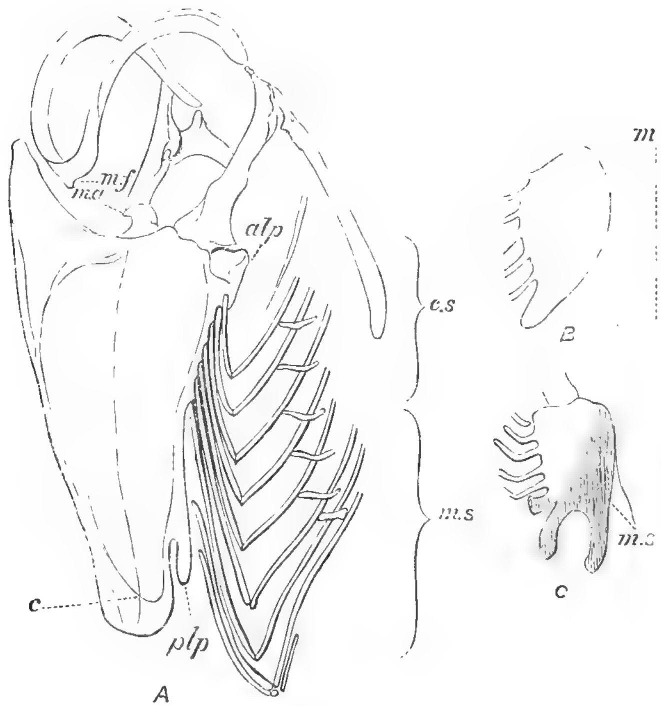
Secondly, with regard to Harting's theory, several objections present themselves at first sight. Were the system of ligaments, with the bony processes which afford them attachment, to be regarded as an "episternum," it would afford a unique case of a bone undergoing degradation at the centre, yet ossifying at odd points in its original periphery. Again, there is no reason to place any especial emphasis on the occurrence of the ossifications indicated, since all ligaments tend to present occasional ossifications. Further, the fact that the ligament system of the Ostrich is claimed as an episternal apparatus in which the clavicles have not been differentiated, amounts to a *reductio ad absurdum* of the theory; for these ligaments, exceedingly thin in the adult, are scarcely possible to find in the embryo, in which, on Harting's hypothesis, we should expect to find them better developed.

It appears, then, that the evidence for the interclavicular homology of the keel must rest on the embryological researches of Götte and Hoffmann. For this reason, further evidence upon the disputed point of the keel has been sought in a series of embryos of five types. All points of interest observed in these embryos are described in the ensuing section, Part II. It is to be noticed, however, that some difficulty occurs in comparing the results obtained with those of the

[1] It is possible, however, that they may be comparable to that of the Jerboa or the Kangaroos, in which animals this process is probably a secondary addition to the costal sternum, or even to the xiphisternum of the Frog, which also is an appendage to a costal sternum, if Ruge's view of the latter be correct.

above-named observers, owing to some discrepancies in their statements as to the age of embryos. Götte describes the establishment of coracoid, clavicle, and sternum in chick embryos of the age of 4–5 days, and yet considers that his embryos were slightly older than

Fig. I.



A. Sternum of adult Guillemot (*Uria troile*). B. Sternum of Ostrich embryo, consisting, before fusion of the lateral halves, of costal sternum only. C. Sternum of Chick embryo, consisting, before fusion, of both costal sternum and metasternum.

c.s, *costal sternum*, extending from the attachment of the coracoid to that of the last sternal rib; *m.s*, *metasternum*, extending posteriorly from the last sternal rib [1]; *m.f*, median furcular apophysis; *m.a*, median anterior sternal apophysis; *a.l.p*, anterior lateral process of the sternum; *p.l.p*, posterior lateral process of the sternum.

Rathke's. These descriptions do not correspond with the usually received opinion that the histological differentiation of the mesoblast takes place during the fifth day of incubation in the chick [2]; still less

[1] This region does not exactly correspond with L'Herminier's metasternum, for that bears some of the posterior ribs, and therefore includes part of the costal sternum.
It corresponds, however, with the region occupied by Parker's Lophosteon + Metosteon + Urosteon, in other words its extent is not only posterior but also median. In short, the term metasternum is used here to express rather its development in time than its position in place.

[2] 'Elements of Embryology,' Foster and Balfour, 2nd ed. p. 270.

do those of Hoffmann, who describes the connection of sternum and clavicle taking place "durch an Knorpelzellen reiches Bindegewebe," in sections of *Carbo cormoranus* "von zwei Tage alten *Embryonen*." Götte's sections of 4–5 days' chicks probably correspond with those called chicks of 6 days' incubation in the Cambridge Morphological Laboratory. In these, however, I fail to detect the darker tissue which he describes as connecting sternum and clavicle. They correspond with the earliest stages which I have dissected, figured in Plate XLV. figs. 9, 10, 12, 14.

The nomenclature used throughout this paper is explained by Fig. I. p. 690.

Part II. Details of Embryonic Development in five Types, namely (i.) the African Ostrich (*Struthio camelus*), (ii.) the Guillemot (*Uria troile*), (iii.) the Gull (*Larus*), (iv.) the Chick, and (v.) the Gannet (*Sula alba*).

These embryos were not examined in sections, but were dissected; and this for two reasons: first, comparison of stages is easier if one method of preparation is employed throughout; and the younger specimens can be dissected, whereas the older ones, with which it is safest to begin, cannot be made into sections; secondly, sections are useless in studying the development of muscles, which is of necessity intimately connected with that of bones, and may therefore give some clue to their history. A chick in which the pericardial cavity is not yet closed can be dissected with perfect accuracy under a strong lens: indeed dissections can be made at a stage so early that they are useless, since the microscope shows little difference between various cells, and there is no means of checking the results of dissection by the histological character of different parts; this is a consequence of the fact that the first change the differentiating cells undergo is a change in their firmness and closeness. Plate XLIV. figs. 3–5 correspond with the stage called "early 6th day" in the Cambridge Morphological Laboratory, sections of which show comparatively little differentiation in the cells of the future shoulder-girdle.

(i.) The Ostrich.

(7 individuals, embryos respectively of 27, 25, 21, 15, 10, 7, and 4 days' incubation.)

The adult Ostrich still presents certain Reptilian features: to wit, (*a*) the presence of two claws on the 1st and 2nd digits of the wing, while other birds that possess such claws, for example Rhea and the Swan, have only one, and most birds have none; (*b*) the broad coracoid, consisting of two parts separated by a foramen. These facts appeared to render it possible *à priori* that in the embryo traces of the Reptilian interclavicle also might be present, either free or, as suggested by Götte's theory, in the form of a rudimentary keel; for the absence of the interclavicle is not implied in the loss of clavicles, as may be seen from its existence in the Crocodile; but, on investigation, no trace was found either of interclavicle, clavicle, or keel. Too much stress cannot be laid on the absence of the latter, since the character of the fore limb as a true although degraded wing has frequently led, from a point of view exactly opposite to that of Götte, to the suggestion (founded on no other evidence than the analogy indicated) that the sternum of the Ratitæ has lost a formerly existing keel: this statement must now be directly negatived. The absence of a keel might indeed be inferred, by all who do not share Götte's view as to its origin, from the smallness of the pectoral muscles, the earlier stages of which afford no ground for supposing that they have assumed their present condition by degradation from a carinate type.

It is unfortunate that no observations have been made on the early embryos of *Rhea* or *Casuarius*, or above all on those of *Dromæus*, whose rudimentary clavicles and single sternal plate mark a type singularly different from the other Ratitæ. The Ostrich embryos, however, presented numerous points of interest, given below.

1. In the 4 days' embryo, *scapula and coracoid are not united*; this points to the conclusion that their subsequent union is a secondary rather than an ancestral reptilian condition. Furthermore, the *coracoid and precoracoid are separate*. Götte and Hoffmann both came to the conclusion that the distinction between the two parts arose by the establishment of a foramen in a cartilage originally uniform; the 4 days' embryo shows, however, that the division between them is of different origin. The precoracoid thus exhibits its maximum development in the earliest stage; in the adult it sometimes shows a tendency to atrophy (*cf.* Plate XLII. fig. 9; Bronn figures a similar specimen). In the absence of further evidence this fact would have gone far to justify a belief that the precoracoid was wanting in the shoulder-girdle of other birds, but, as will be seen hereafter, there are reasons for a contrary opinion.

2. The rectus abdominis muscle is in the 7 days' embryo attached to the unfused sternal halves, passing up between them in the median line, about to the level of the third sternal rib, where they meet one another; the muscle is broad, and its lateral portions exhibit two thick bands which are attached to the sternal halves. In the adult the median portion is attached to the borders of the cartilaginous metasternum, which is apparently developed for its support, while the lateral portions become very thin.

3. In the 4 days' embryo are seen eight thick transverse muscular bands, overlying as many ribs, *i. e.* all except the two anterior free ribs: in the case of the two posterior ribs, these muscles are longer than the ribs; and in the case of the posterior sternal ribs, they do not follow the sharp curve which these make towards the sternum, but pass nearly straight towards the median line, so that they only overlie the ribs during part of their course. Towards the spine they become lost in undifferentiated muscular tissue. These muscles are on no account to be confounded with the muscle-plates as apparent in a four days' *chick*; bands similar to them appear in a *six days' chick*: their position also, as stated, corresponds with that

of the ribs, *i. e.* is not, like that of the muscle-plates, intravertebral. This supercostal position it will be seen, however, from comparison with other types, is only a secondary arrangement occurring during part of their course, in consequence of the curvature of the ribs. They represent, in fact, traces of the *intercostales externi* of ribs in their primitive arrangement, before they acquired their present modifications in connection with the sternum.

4. Although the sternum as a whole is greatly lengthened in the course of its development, owing to the appearance of the metasternum, yet its costal portion loses one posterior attached rib; there are six sternal ribs in the embryo, five in the adult. Further, a seventh rib, although never attached to the sternum, shortens considerably in the course of development, which implies that it was once a sternal rib. The position of the primitive intercostales externi of the two unattached posterior ribs in the four days' embryo, being, as they are, longer than the ribs they accompany, leaves little doubt that both originally entered into the formation of the primitive costal bands.

5. The series of embryos shows the gradual *addition of the anterior lateral process* to the costal sternum.

6. The 7 days' embryo shows an anterior part which may probably be compared to the *manubrium sterni* of mammals. Its extent in front of the first sternal rib, at a stage when none of the parts known to be of secondary origin have as yet been added to the costal sternum, taken in connection with the existence of two anterior spinal ribs of which the second is very long, seems sufficient to prove its costal origin. Further, St. George Mivart[1] records the appearance in the Ostrich of a rudimentary sternal rib, the first of six, which was not attached to the corresponding spinal rib (the 3rd); from the number and position of the spinal ribs he describes, namely ten, whereof the two posterior are not attached to the sternum, it appears that this rudiment corresponds with the first sternal rib, fully attached to the corresponding spinal portion, of the seven embryos here described. This affords a further reason for supposing that the process of atrophy extended in the above-named specimen to the third spinal rib has taken place already in the case of the first and second.

7. Comparison of the 15 days' embryo with preceding stages shows the *addition of the metasternum* to the costal sternum. Although this region, seen in all subsequent stages of the embryo, is in perfect continuity with the cartilage of the original costal sternum, yet in the adult (as appears in Plate XLII. fig. 9) only a small part of it is ever ossified. In *Rhea* still less of it is ossified, so that the halves of the sternum remain united by cartilage only. Apparently these do not, however, correspond exactly with the primitive halves; for a fontanel, nearly closed by thinner bone, marks, in some specimens, a boundary corresponding in position with the notch that separates off the posterior lateral process of the Ostrich (*cf.* fig. IV. *f*, p. 710).

[1] "Axial Skeleton of the Ostrich (*Struthio camelus*)," by St. George Mivart, F.R.S.: Trans. Zool. Soc. x. p. 1.

8. *The differentiation of the lateral processes of the metasternum*, which also are not ossified even in the adult, is traced by their connection with the muscles. They are prolongations, established between the ages of seven and ten days in the embryo, of the ends of the primitive halves of the costal sternum, to which the lateral parts of the rectus are attached. In later stages this lateral part of the rectus becomes very thin, and the processes are found to afford attachment in addition to part of the obliquus externus, as is usually the case with the posterior lateral processes of the sternum in the Carinatæ. Coincidently with this change of their muscular relations, the ends of the processes develop between the 15th and 21st days a double outgrowth, resembling the end of the xiphoid process in the Chick, and apparently due in both types to the somewhat lateral direction of the strain exercised by the obliquus externus. The attachment of this muscle becomes rather obscure in late stages, because in the adult its major part is, as stated by Bronn, aponeurotic; I find that it may, however, be still traced to the process in a bird newly hatched.

It appears, then, that in the Ostrich at any rate the posterior lateral processes consist of the ends of the primitive costal bands, preserved and prolonged for the attachment of the lateral part of the rectus, and subsequently modified to afford attachment to the obliquus externus. Their change of use is due to the reduction that takes place, during the establishment of the Avian type, of the rectus, which muscle finds its maximum development in Reptiles. The primitive costal origin of these processes finds a parallel among the Carinatæ in the case of the Gannet: it is interesting, too, to compare them with the costal processes of the sternum in *Iguana*, formed by the fusion of the sternal portions of posterior ribs.

These processes, as existing in the adult, may be considered a part of the metasternum, since the primitive part bears but a small proportion to the later additions.

(ii.) The Guillemot.

(13 specimens, from about 17 days' to 6 days' incubation.)

This type exhibits two marked peculiarities: (*a*) the great development of the keel and median furcular apophysis; (*b*) the elongated condition of the sternum, which in the adult ossifies seven ribs and is very narrow The former character, since the bird has small wings and flies but little, must be attributed to the necessity for strengthening the fore limbs in swimming; the second seems to be correlated with the general elongation and narrowing of the trunk established in connection with the habit of diving. The embryos dissected exhibited the following points which call for remark :—

1. The union of the clavicles takes place very early; in a 6–7 days' embryo, when the sternal halves are not yet united, they are already closed, and the median furcular apophysis is mapped out in cartilage continuous with the clavicles. The embryos examined were hence unsuitable for inquiry into the origin of the latter structure, but they

gave ample opportunity for investigating the formation of the keel, which attains a maximum development in this bird, and ought therefore to afford a clear interpretation of its origin. Now the keel, according to Götte's theory, is formed by the posterior growth of the clavicles in the median line; this growth ought, then, to be traced in stages subsequent to the one described, in which the clavicles are already united, but in which the median line posterior to them is occupied solely by muscular tissue, underlying the thinnest possible tract of skin. Such, however, is not the case; the median part of the furcula never exhibits any further posterior growth than in the six days' embryo, where it has the same relative extent as in the adult. The sterno-clavicular ligament, too, which in the course of the process of growth supposed should be formed before the more posterior keel, is entirely absent in the 6 days' embryo, but appears in an embryo of about 8–9 days, where the keel is fully formed; moreover, far from exhibiting the retrogression with advancing age necessary *ex hypothesi,* since it is supposed to have taken place in the course of phylogenetic development, this ligament is very fine at first, and augments in strength as it approaches the adult stage. Stages were not obtained which showed the gradual development o the keel as in the Chick.

In consequence of the early closure of the clavicles, which, as stated above, takes place before the sternal halves are fused, the rectus is attached, at this stage, to the *clavicle,* a condition to be contrasted with that which occurs in the Chick (*v. infra*).

2. The rectus, in stages considerably later, presents a remarkable complexity. In the embryo of some 12–16 days it is divided into three parts, described below:—

A. *Outer sheet,* very thin and continuous with the posterior part of the pectoralis major. This condition of the muscles named was observed in several of the Carinate types examined, while in the case of the Chick something similar occurs at a much earlier stage; the outer part of the rectus[1] described becomes gradually atrophied until the pectoralis major acquires its usual independent character. The above facts suggest that the pectoral muscles have been phylogenetically differentiated from the thoracic region of the rectus, their establishment taking place in connection with that of the sternum, which breaks up the uniformity of the latter muscle, primitively continuous from pubis to jaw. This conclusion is to some extent borne out by the condition observed in certain reptiles, where the distinction between the pars abdominalis pectoralis and the rectus lateralis has been attended with some difficulty[2]. Moreover, there exists in the Penguins

[1] This part of the muscle thins away posteriorly, and cannot be traced to the pubis; but we are not therefore entitled to deny it the character of rectus; for *cf.* the condition in some Reptiles (*Monitor* and *Lacerta*), where in the subcutaneous part of the muscle some of its fibres become attached to scales. *Vide* account of the Abdominal Muscles of Reptiles, by H. Gadow, Ph.D.

[2] For a full discussion of these muscles in Reptiles, see the same paper; which states that in *Ptyodactylus* the pars abdominalis pectoralis reaches as far as the third inscription of the rectus ventralis; but that in *Monitor, Lacerta,* and *Cnemidophorus* it is often found coalesced with the rectus lateralis.

(Spheniscidæ), partly overlying the pectoralis medius, a muscle described by Watson and named by him the Dermo-humeralis, which takes its rise from the head of the humerus, and forms in the abdominal region a thin band of longitudinal fibres lying near the median line: this is, in other words, a ventral part of the rectus continuous with a lateral part differentiated from the pectoralis. In these birds also the rectus is complex, consisting of two sheets (Watson *apud* Bronn).

B. *Middle sheet*, most massive of the three, and attached to the posterior-lateral borders of the sternum, which apparently corresponds with the rectus of other birds.

C. *Thin inner sheet*, which has the transversus attached to its edges. This takes attachment after passing *inside* the sternum for nearly one third the whole length of the latter. In the later stages its attachment travels backwards towards the end of the sternum, till in the embryo of 17 days it is completely united with the main body of the rectus, while the transversus has acquired its usual position with regard to the latter. This late ontogenetic change in the rectus seems to represent the posterior translation of the attachment of the rectus, during the late phylogenetic development of the long metasternum characteristic of this type, which apparently splits the muscle in two, and carries the upper part backwards as it grows.

3. In the earliest stage of the Guillemot, as in the Ostrich, there are seen transverse bands of muscle; these are afterwards lost, and fused into a uniform supercostal sheet continuous with the obliquus externus. This supercostal sheet eventually, in the latest stages examined, acquires attachment to individual ribs, while at the same time the obliquus externus acquires an attachment to the ribs and lateral borders of the sternum; the phylogenetic meaning of these changes is obvious.

4. There are indications of a slight posterior shortening of the costal sternum. There are 7 sternal ribs in the adult, but in the early embryo 9; of these the 7th, 8th, and 9th have no uncinate processes. Fig. I. (p. 690) shows an adult specimen in which the 9th rib is not only free at its sternal end, but atrophied also towards the dorsal region of its spinal parts. This mode of atrophy at both ends, which leaves a rudiment of the middle part of the rib, occurs again in the Chick. In the Ostrich, as has been seen, atrophy begins at or near the sternal end, and travels uniformly towards the spinal region. Neither in the Chick nor in the Ostrich do we find that marked division between spinal and sternal portions of the rib which in the case of the rudimentary 9th rib of the Guillemot divides it into two pieces.

The allied species, *U. brunnichii*, may be compared with this; the adult has also 7 sternal ribs, and 2 posterior ribs without uncinate processes, which do not reach the sternum.

There is also some indication of anterior shortening of the sternum, for one of the early embryos shows the attachment of a rib, which in the adult (*cf.* Plate XLIV. fig. 9) falls short of the sternum.

5. The metasternum is remarkable for the great reduction of the

lateral processes, and for a crescent-shaped ridge at the end. The former character is easily understood if we regard these processes as homologous with those of the Ratitæ, and consider the metasternum to have received special elongation at a late date. Plate XLIV. fig. 9 shows a condition which supports this view; the median part of the metasternum is here not longer than the process, while in the adult it is considerably longer; also the process is continued anteriorly into a ridge forming part of the undoubtedly costal sternum, which may be distinguished from the thinner cartilage of the metasternum adjoining it towards the median line.

The crescent-shaped ridge marks the posterior insertion of the pectoralis minor, which thus lies as it were in a depression of the sternum; this muscle is remarkable for its strength and its great elongation, taken in comparison with those of the pectoralis major.

(iii.) The Gull.

(11 specimens, from about 16 days' to 5 days' embryos.)

1. In several individuals of about 14 days there was traced a thin ventral portion of the rectus continuous with the pectoralis major.

2. Two specimens of about 11 or 12 days exhibited traces, consisting in greater thickness and greater strength of the fibres in the regions indicated, of a division of the rectus into three bands, a median, and two lateral attached to the posterior-lateral processes. In the adult the lateral part of the rectus is, on the contrary, very thin. The embryonic condition recalls that of the Ostrich; possibly the width of the sternum, which is somewhat broad for its length, may be associated with the early lateral thickness of the rectus.

3. The intercostales externi exhibit in the later stages the changes already described in the Guillemot; the supercostal sheet at the stage in which it is continuous sends a thin continuation under the pectoralis major, which passes over the sternum and is attached to it near the borders of the pectoralis minor.

A 5 days' embryo affords the clue to the intercostal nature of the primitive transverse bands seen in the previous types; bands precisely similar are seen alternating with and attached to the ribs, not overlying them as in the former cases; while part of their dorsal extent is already fused to form the continuous supercostal sheet referred to above. The connecting link between the supercostal and intercostal state of these bands is seen in the Chick, where the bands overlie the ribs, but where they are found on dissection to alternate with them in the cervical region.

4. The metasternum has two pairs of processes: of these the outer is identified as homologous with the posterior-lateral process in the Guillemot and Ostrich by the fact that its outer border affords the sternal attachment of the obliquus externus. The inner one is therefore of later origin; perhaps it owes its existence to the peculiarity of the posterior end of the pectoralis major, of which the lateral part is unusually strong and longer than the median, and is attached to

the edges of both processes. The second process is already indicated in the earliest embryos examined, so that it is clearly formed by addition, not by absorption. Plate XLIII. fig. 19, by the presence of the additional filling absent in the earlier embryos, shows an indication that the increased size of the pectoral muscles in birds that fly well demands increased breadth of their sternal attachments, and thus leads to the filling up of the sternum, so that the processes are obscured by their own growth, and finally become confluent.

5. In some, but not all, of the older specimens there was found a 7th sternal rib.

6. The condition of the anterior-lateral part of the sternum, which gives attachment to ribs anteriorly to the base of the coracoid, is to be contrasted on the one hand with the anterior-lateral process of the Ostrich, formed as a secondary addition to the rounded outline of the costal sternum, and on the other hand with that of the Chick, in which an apparent process of the costal sternum is first formed through the loss of two anterior ribs primitively attached and afterwards augmented by a secondary growth.

An old five days' embryo, the earliest examined, calls for a special description. The coracoid (*cf.* Plate XLIII. fig. 8) exhibits a remarkable resemblance to that of the Ostrich; the median depression, however, does not amount to a foramen, and it is filled by a separate mass of tissue, attached to the coracoid itself by embryonic muscular tissue. This specimen, which is quite normal and alike on both sides, seems to compel the conclusion that the coracoid of the adult Gull represents a fusion of the true coracoid with the precoracoid, in which the foramen which remains open in the case of the Ostrich is filled up by further ossification—a conclusion sufficiently startling, notwithstanding that so great an authority as Parker has already combated the assumption that the elements of the shoulder-girdle are the same in all birds. The scapula, as will be observed in the Chick at a similar age, is quite free from the coracoid.

This embryo presents a median mass of tissue, corresponding with the position of the top of the keel. The interpretation of this as an interclavicle is forbidden by the position of the clavicles, which are, as seen in the diagram, very small, far from the median line, and not even directed towards it; further, this centre, separated from the pericardial cavity only by the thinnest connective tissue, occupies a less superficial position than the clavicles, which overlie a thick stratum of embryonic muscle. It will be seen, on the other hand, that this centre arises in closest connection with the already approximated sternal halves. Comparison with a certain occasional median cartilage in the Chick will show that too much importance must not be attributed to this centre in the Gull; the former is also median, but its *posterior* position shows that it cannot be an interclavicle. It must therefore be a formation of recent date, and its occasional appearance shows that the keel has a *tendency*, not yet established, to differentiate itself from the rest of the sternum: this tendency is expressed, in a much lower degree, by the existence of a separate centre of ossification for the keel in the Gull and Chick, as in many other birds. There is every reason to expect that this tendency will occasionally be expressed (as apparently it is in the present instance) by the thick anterior part of the keel, as well as by the posterior part.

(iv.) The Chick.

(37 embryos, from 16 days' to early 5 days'; of which all but 7 were under the age of 12 days.)

1. Continuity of the inner part of the pectoralis with outer fibres of the rectus was observed in Chicks of 7 days. At this age the part indicated cannot be strictly identified, but it seems to occupy the position of the pectoralis minor of the adult.

2. At the age of 6 days the condition of the rectus is peculiar. Its anterior part (the equivalent of the sterno-hyoid and genio-hyoid, of which only a few fibres have as yet been caught up by the hyoid bones) passes between the open clavicles to end in a wedge-shaped piece between the sternal halves, at a stage when the approximation of the latter has already cut the continuity of the primitive rectus band.

This state of the rectus and that described in the Guillemot warn us that embryonic conditions, when not comparable to those of any known adult form, cannot always be supposed to have a phylogenetic value. We can scarcely imagine that there ever existed a type in which, as in the Guillemot embryo, the rectus was attached to the clavicles, while the halves of a highly developed sternum, provided with processes, failed to meet in the middle line; or in which, as in the embryo chick, the presternal part of the rectus passed through open clavicles, while the sternum was closed.

3. The primitive bands of the intercostales externi are seen from the end of the fifth to the end of the sixth day. Their supercostal position seems to be due to the curvature of the ribs, each of these having passed forward under the intercostal muscle of the next; for in the cervical region, where several, usually three, are present anterior to the coracoid, complete dissection shows that they are, as in the case of the Gull, alternate with the rudimentary ribs of this part, although in the sternal region they are supercostal as in the Ostrich and Guillemot. The reason why no such alteration can be traced in the sternal region seems to be that the proximal ends of the bands thin gradually away in the region where the intercostales externi of the adult find their dorsal limit; in the neck region, on the contrary, they can at first be traced up to the spinal column, although at a later stage their spinal ends disappear. No bands were seen in the cervical region of the types previously described.

These bands on dissection are found to consist, at the end of the 6th day, of strong fibres at an angle with the direction of the band; distally these fibres form a blunt mass, so that the band has a round end, abruptly marked off from the thin undifferentiated muscle in which the bands lie.

The reasons for concluding that these bands represent (*a*) the intercostales externi and (*b*) a primitive arrangement are the following:—

(*a*) (1). Their correspondence in number with the ribs, and intercostal position in the case of the Gull and Chick.

(2). Their subsequent fusion into a supercostal sheet, differentiated finally into the intercostales externi.

(*b*) (1). Their curvature, slight as compared with that of the ribs.

(2). Their extent beyond corresponding ribs, in the case of the cervical ribs of the Chick, and posterior ribs of the Chick and Ostrich.

It is to be hoped that further research may elucidate the origin and exact relations of these bands; the inquiry must be attended with some difficulty, however, since the mesoblast has but recently acquired histological differentiation when they present the appearances described.

4. The evidences of the shortening of the sternum are the following:—the adult condition presenting five ribs with uncinate processes and two long unattached ribs without them, one anterior and one posterior.

(*a*) *Anterior shortening.*

(i.) Chicks of 7 days showed in a number of cases the elongation of 1–3 ribs anterior to the first of those named above; none of these reach the sternum.

(ii.) Chicks early on the 6th day invariably showed two at least of these ribs fully attached to the sternum; they are very small and close together.

(iii.) The anterior muscle-bands, previously described, which atrophy from their spinal ends onwards, suggest that their corresponding ribs have passed into the sternum and disappeared by a process of atrophy like that already noticed in the Ostrich. This view is supported by the condition of a 5 days' Chick, which shows four of the muscular rudiments named overlying four minute masses of cartilage near the median line; this specimen is in many respects abnormal, but certainly these rudiments suggest the former existence of a pre-sternum.

(*b*) *Posterior shortening.*

In about one out of every four Chicks from 6 to 8 days incubated, there is a rudiment of a posterior 8th rib, atrophied at both ends as in the Guillemot; in earlier stages this rib is seen, but not so frequently, attached to the spinal end, or even at both ends. Before this rudiment disappears it approaches very close to the next rib, apparently because the intercostal muscle uniting them does not grow so fast as those elsewhere, and in one case the rudiment is seen attached to the next rib, forming a process (*cf.* Fig. III. diagr. *a*, p. 708). The 7th rib itself is often attached to the sternum up to the end of the 9th day.

The condition of the ribs in the ancestor of the Fowl, thus shown, may be compared with that of allied forms, the Waterhen and the

Rail. The posterior shortening is evidently of much more recent date than that just described at the anterior end.

5. There appeared indications of the compound character of the sternum. Several 5 days' Chicks, in which the pericardial cavity was not quite closed, exhibited, as already mentioned, thickenings alternate with the sternal ends of the ribs. Sowewhat later 5 days' Chicks showed (in that anterior part which by the end of the 5th day gives attachment to the coracoid) irregular thicker masses incompletely united.

If these traces of structure in the sternum appear somewhat slight to have any value assigned to them, it must be remembered that early on the 5th day *aggregation* of tissue is almost the only sign of differentiation of the mesoblast. Such aggregation is frequently seen better in dissections than in sections.

6. The posterior processes of the sternum are mapped out very early. In the Chick a newer process is added on the lateral aspect of the posterior-lateral process, whereas in the Gull one is added towards its median aspect. This process, the external xiphoid, appears in a 5 days' Chick as a minute outgrowth from the posterior-lateral process; its development may be traced by comparison of the diagrams.

Plate XLV. fig. 10 shows a 6 days' Chick with a sternum quite abnormal, in which two other processes appear. Possibly they may be formed as rudiments of the 7th and 8th ribs previously attached to the sternum; but the whole structure of this specimen is abnormal, especially in the following respects—(1) The position of the primitive intercostal bands, of which four lie ventral to the metasternum and nearly meet over it in the median line; (2) the condition of its coracoid aspect; and (3) the four rudiments in the neck, already described.

Finally, there remain to be discussed, 7, the *formation of the keel*, and 8, the evidences for or against the existence of an interclavicle.

7. In three Chicks out of the thirty younger specimens, there was found a separate cartilaginous centre for the keel. The ages of these three were 7 days. Two of the three centres are figured, to show that their posterior position precludes their being interpreted as interclavicles; the third was precisely similar; the clavicles at this stage are still open.

With these exceptions the keel was found to appear with the fusion of the halves of the sternum; these approach late on the 6th day and fuse gradually from the 9th till the beginning of the 10th day; as the fusion passes backwards, so does the keel. It is at first low, but afterwards acquires its full height. These facts, taken in connection with that long ago established by L'Herminier, that ossification of the keel commences at its base (where the keel is not, as in the Duck and Heron he states it to be, ossified by fusion of paired centres in the sternum), point to the conclusion that the keel is a structure formed by the fused edges of the halves of the sternum. Its centre of ossification is, according to the same authority, the last to appear in the sternum of the Chick. Götte's account of the formation of the Chick's keel is, however, as follows:—*Stage* 1: at an age when both sternum and clavicles are cartilaginous, they are united by a tissue, which at the age of 5 days is comparatively thin and dim, but between 4 and 5 days is dark. *Stage* 2: subsequently, but still prior to the closure of the sternal halves, this tissue looks like a projection continuous with the sternum. *Stage* 3: the cartilaginous borders of the episternal region of the clavicles meet to form the keel: at what date this takes place he does not make clear, but it must be either during, or prior to, the latest stage he describes, viz. the 8 days' Chick, in which he considers the median broadening of the tract of commencing ossification in the furcula to represent the ossifying interclavicle.

Now in the specimen examined the said dim and thin tissue between the clavicles and sternum was never observed to present such an appearance as that described in Stage 2; but it was differentiated, immediately on the complete differentiation of the mesoblast, into muscular fibres, forming a tract that gradually narrowed as the clavicles closed. During the closure of the sternum it becomes reduced to a thin string; and all muscular fibres having now disappeared from it, it assumes its character as the sterno-clavicular ligament of the adult. No indication was observed tending to show that its origin differed from that of other ligaments contemporaneously established, such as those of the wing; nor was there seen any stage in which the cartilaginous borders of the so-called episternal region of the furcula approached the keel; they were always separated from it by this tract, first consisting of embryonic muscular fibres, and afterwards of thin ligament.

8. So much with regard to the development of the keel; if we accept the view that it is an apophysis of the sternum, established for the attachment of the pectoral muscles, we have none the less, however, to examine the evidence as to the existence of an interclavicle. That the furcula presents a median prolongation, is undeniable; but the following statements on two points will show reasons for supposing it to be an outgrowth derived from the clavicles only at a late date.

(1) *Date of the formation of the so-called Interclavicle.*—It is somewhat difficult to ascertain the exact age of Chicks later than the 5th day of incubation, because the changes they undergo are comparatively slight; but we may recall the fact that the two anterior ribs lose their attachment to the sternum about the end of the 6th day, while the occasional free rudiment of a rib eighth from the first long one of the adult is never seen later than the 8th day. In other words, the ribs at any rate have established their *generic* characters at this date, which renders it probable that the broadening ossification of the median region of the clavicles, described by Götte as established during the 8th day, is an outgrowth of the Avian furcula rather than a pre-Avian interclavicle—a view which is expressed by giving to it (as has been done throughout this paper) the name of *median furcular apophysis* rather than of *interclavicle.*

(2) *Position of parts in the Shoulder-girdle of the 5 days' Chick.*—

It is always stated that the coracoid and scapula of the Chick arise as a single plate, but the various specimens examined did not bear out this description. The shoulder-girdle of the 5 days' chick, in which the pericardial cavity is not quite closed, is shown in figs. 4 and 5, Plate XLIV. It consists of three pieces, whereof the middle one is partly attached to that nearest the median line. According to Götte, who maintains the usual view that the scapula and coracoid form a single plate, and who further describes the episternal projection of a 5 days' Chick as clearly distinguishable from the clavicle itself, these three pieces would be interpreted as coraco-scapular plate, clavicle, and interclavicle; but this interpretation, rendered doubtful by the early separation of scapula and coracoid, already noticed in the Ostrich and the Gull, is rendered impossible by comparison of subsequent stages. Plate XLIV. figs. 3, 4, 5, and 6, show how the median piece gradually elongates, without growing thicker, and forms the clavicle, while the intermediate and the dorsal piece fuse to form the coraco-scapular mass usually described, which was found to exist early on the 6th day (fig. 6). The late date of its appearance suggests that this fusion may represent rather a Struthionic than a pre-Avian condition.

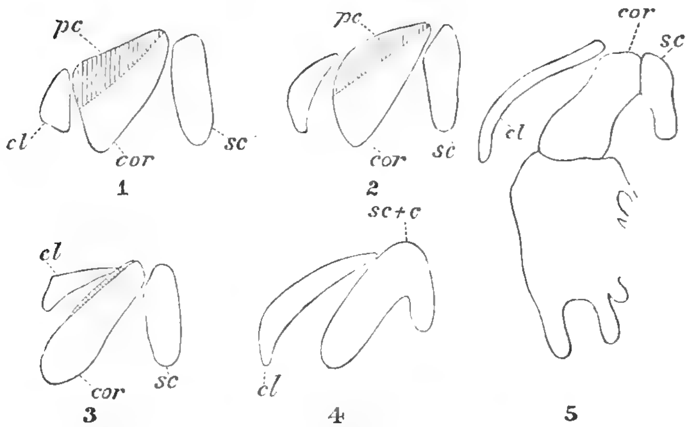
The interpretation as clavicle of the median piece which is partially attached to the intermediate one, agrees with the description of Rathke, who says that at an early stage the coracoid and clavicle are united dorsally but not ventrally; nor is it inconsistent with that of Götte himself, who says the end of the coracoid passes under the clavicle, which is the same thing in other words. Now the median piece, though posteriorly free, is united anteriorly to the coracoid; and this anterior union is *dorsal*, for the two pieces appear separated by a crack when seen from the surface (*cf.* figs. 3 and 4), yet on dissection they are found united below.

At first sight the relative positions of the two pieces present a difficulty in the interpretation just given, viz., that they are placed end to end, not parallel as in the adult, so that the clavicle is separated from the scapula by the whole length of the coracoid. The same difficulty, however, attends Götte's account of the relation of the two parts; since, although he traced the end of the coracoid under the outer end of the clavicle, he expressly states that he failed to trace it far towards the median part of the clavicle; in other words, he also found the two placed, at this stage, end to end.

Again, a second difficulty lies in the fact that the intermediate piece of the shoulder-girdle is triangular, which the coracoid is not. During the 5th day, however, it loses this triangular shape, and is no longer found to be, as at first, a flat mass, comparatively thin. This change suggests that possibly the anterior apex of the triangle is equivalent to the precoracoid of the 5 days' Gull (which also forms a mass lying between the clavicle and scapula), and that the clavicle is gradually carried up towards the dorsal end, by the atrophy of that part, with which it is in close connection. This theory is best explained by the following series of diagrams. Reference to the Plates will show that, although themselves diagrammatic, these figures correspond exactly with those drawn from actual specimens in different stages (see Plate XLIV.).

It is to be clearly understood that the broadening median end of the clavicle, which Götte describes in its condition during the 8th day of incubation, and interprets as an interclavicle, has nothing to do with the broad median end of the triangular clavicle figured below. The clavicle becomes uniformly thin throughout its length toward the close of the 6th day, as shown in diagram 3, fig. II.

Fig. II.



1, 2, 3, show changes in the shoulder-girdle of the Chick, late on the 5th day of incubation; 4, shows its condition during the 6th day; and 5, its condition late on the 6th day, when the coracoid bone has acquired its sternal attachment and the coracoid and scapula have almost separated.

The view above suggested with regard to the presence of a rudimentary precoracoid in the Chick at a early stage, is borne out by comparison of the condition of the internal part of the coracoid in various types.

Beginning with the Ratitæ, we see that where the precoracoid is apparently lost, there seems to be a rudiment of it remaining in the form of a process of the coracoid, situated in *Dromæus* (Plate XLIV. figs. 15 and 16) just beneath the clavicle. In *Casuarius* it seems possible that the area of bone extending internally to the *foramen* or *incisura coracoidea*[1] is also comparable with the precoracoid, since in *Struthio* the said foramen is situated near the internal margin of the bone; but whether this precoracoid area is not rather a new growth of the coracoid than the homologue of the Struthionic precoracoid, is very uncertain. The peculiar marginal foramen seen in Plate XLIV. fig. 7 is seen partly developed, occasionally, in the Ostrich, where the precoracoid is present—a fact which supports the

[1] This gives a passage to one of the nervi brachiales inferiores; this nerve supplies the m. supracoracoideus (called pectoralis minor elsewhere throughout this paper).

former view rather than the latter. Even in *Casuarius* it is only occasional (*cf.* fig. 8).

The same uncertainty must exist with regard to the precoracoid of *Diomedea* (fig. 1, Plate XLIV.); although there can be little doubt, from comparison with the early stages of the various embryos figured, that we must agree with Sabatier in regarding this region as the Avian precoracoid, rather than the precoracoid of Parker, which Sabatier calls an epiphysis (*cor. ep.*, fig. 1).

Under these circumstances it would be hazardous, notwithstanding the Struthionic aspect of the coracoid in the Gull, to put forth with any certainty a view that the pre-Avian kind of precoracoid is to be identified with the region suggested as precoracoid in the Chick; but at the same time the development of this marginal region in the types figured renders it extremely likely that the region already described in the shoulder-girdle of the late five days' Chick is equivalent to a precoracoid of some kind, though possibly of a secondary character, developed in the more immediate ancestors of the Gallinaceæ.

(v.) The Gannet.

(9 specimens, from the bird just hatched to a stage comparable with a 5 days' Chick.)

The sternum of the adult Gannet, it may be observed, since it possesses a furcula continuous with the keel, and behind it a median paired apophysis for the support of ligaments, exhibits at once the interclavicle of Götte in front, and the interclavicle of Harting at a more dorsal level.

In this bird, if in any, we might expect to trace a genetic connection between clavicle and keel, since in the adult these parts are fused. Such, however, is not the case.

The embryo is particularly easy to examine, because it is so large that the earliest aggregations in the mesoblast can be clearly traced. The following were the stages observed, recorded, for the sake of convenience, in inverse order, youngest first.

1*st Stage, corresponding with a five days' Chick.*—There are 8 ribs, which end freely, and no trace of sternum. The three parts of the shoulder-girdle are separate and almost parallel, overlying a remarkably thick mass of tissue representing the pectoral muscle.

2nd Stage, corresponding with a later five days' Chick.—The sternum is indicated by thick opaque aggregations in a layer of mesoblast, shown in fig. 14, Plate XLV. A large mass indicates the sternum, a smaller one the keel, while three smaller masses, which in the next stage have disappeared, may probably be compared with the three anterior muscle-bands previously described in the Chick. The end of the clavicle, which is of course superficial, lying next to the skin, is completely shut off from the deeper layer, in which lie the differentiating sternum and keel, by the whole thickness of the pectoral muscle, a depth nearly half the length of the clavicle itself.

3rd Stage, corresponding with a six days' Chick.—This shows the sternum fully formed, lying in a position corresponding with that of the masses just described, and fused with the rib. The keel exists as a broad and thick longitudinal ridge, divided from the body of the sternum by a deep groove on the dorsal side. The coracoid has now acquired attachment to the sternum; the clavicle is still shut off from the sternum by the pectoral muscle. The scapula does not join the coracoid to form a coraco-scapular plate, either at this or any other stage. A rudiment is apparent of the ligament joining the top of the coracoid with the top of the keel; and a very strong rudimentary ligament, reduced in later stages, unites the top of the scapula with the top of the keel. The anterior-lateral process is very thin and trilobed, which perhaps indicates an origin from three anterior ribs belonging to the three anterior muscle-bands indicated in the last stage. There are 7 sternal ribs.

The outline of the fore limb at this stage indicates a division into three digits; it is shown in Plate XLIII. fig. 4 *a*, for comparison with the fore limb of the 7 days' Ostrich.

4th Stage, corresponding with a Chick of about 12 *days' incubation.*—The lateral halves of the sternum are closed, the keel is fully formed, and the pectoral muscle has acquired the adult structure, namely, of three interconnected sheets. The clavicle is united to the keel, but dorsally a thin crack still indicates their junction (fig. 16, Plate XLV.). The anterior-lateral process of the last stage has been atrophied; this fact may be compared with that of the loss of the two anterior ribs at a subsequent stage. On the right side is seen the peculiar insertion of the coracoid characteristic of the adult.

The posterior-lateral process of the metasternum has been added. No *posterior* reduction of the ribs is to be traced. In fact the posterior part of the sternum seems to retain what we may suppose to be a primitive type, as will be seen on comparison of the successive stages (figs. 15, 17, 18, Plate XLV.) with those of the Ostrich (figs. 3, 4, and 5, Plate XLII.). We may contrast these with the condition of the metasternum of the Chick, doubtless a form highly specialized in this respect as in many others; in it, as we have seen, the processes of the metasternum are established from the first.

5th Stage, corresponding to a 14 *days' Chick.*—This shows the addition of the median process of the metasternum. The double apophysis of the median and anterior region is not added till a later stage. In the Chick, the median anterior apophysis is added between the end of the 9th and the beginning of the 14th day of incubation.

Part III. Conclusions drawn from the above data, *in connection with facts previously known.*

1. Conclusion drawn from the existence in the embryo of anterior ribs atrophied in the adult, of which some are seen attached to the sternum, and of muscle-bands apparently representing the intercostales

externi of these ribs[1]:—*that the sternum of birds has undergone an anterior shortening*, consequent on that posterior translation of the shoulder-girdle which is at once expressed by the lengthening of the neck and the shortening of the trunk in the Avian as compared with the Reptilian type; owing to this change of place, the front part of the sternum has been severed from the ribs that formed it, so that these are now atrophied, and only traced in the embryo.

It can scarcely be doubted that the manubrium sterni of mammals owes its origin to ribs lost in a similar shortening of the trunk, by which the seven constant vertebræ of the mammalian type established their cervical character, ribs which are still present in the Monotremes. The part of the Avian sternum called by Huxley the "manubrium" or "rostrum" has, however, nothing in common with the manubrium sterni of mammals; it is a secondary outgrowth formed for the attachment of the sterno-clavicular ligaments. The anterior portion of the sternum of the *Ostrich*, however, is truly a kind of manubrium; it projects anteriorly between the attachments of the coracoids, and, as is seen in the diagram (Plate XLII. fig. 3), it projects far in front of the first sternal rib.

2. Conclusion from the atrophy observed to take place of one or two posterior ribs, and the addition of the median and posterior part seen to take place in the embryo of the Ostrich:—that the posterior shortening of the sternum suggested by Gegenbaur is but slight, varying in different types; and that it is far more than compensated by the addition of the long metasternum.

3. Conclusion from the development observed, in connection with changes in the muscles:—

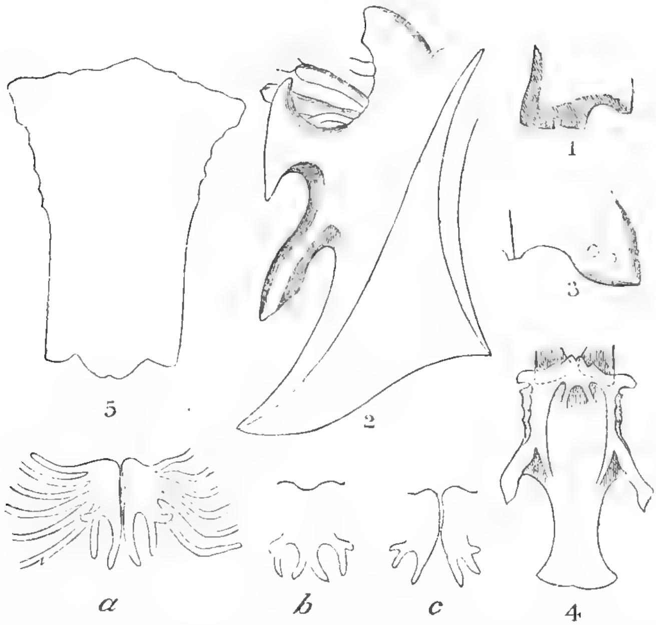
That the posterior lateral processes, though primitively representing the ends of the costal bands, are elongated and modified in various types according to the exigencies of mechanical strain. For this reason they are never found in connection with posterior ribs that suffer atrophy, as might at first sight have been expected from comparison of the costal processes of the sternum of *Iguana*.

The great variation in form of the processes leads us to look for some modifying cause that varies in the types to which they belong. Now since the posterior border of the sternum affords attachment to two opposite sets of muscles, (*a*) the pectoral, (*b*) the abdominal, the resultant of their forces must be to some extent expressed in its shape, for in general the outline of a bone tends to express the direction and strength of the mechanical forces acting on it. In other words, we should expect to find the posterior border of the sternum varying with the habits of the bird, whether it is a good flyer, and uses its pectoral muscles most, or is accustomed to run or hop, and thus makes a greater proportional use of its abdominal muscles. This is exactly what takes place: in birds of great power of flight the processes become long, broad, and finally confluent, so that a long

[1] It is understood that the m. longus lateralis cervicis (Gadow, Bronn, Vögel, p. 117), *i. e.* m. longus colli externus of Watson, seen in the Spheniscidæ (*op. cit.* p. 61), is a continuation and serial homologue of the mm. intertransversarii and intercostales externi.

sternum, plain in outline, is produced; in birds that hop and run more than they fly, long, thin processes are seen for the attachment of certain abdominal muscles, but the rest of the sternum is not filled up, so that we have a very short sternum with complicated processes. In proof of this, contrast the sternum of the Gull, in which the two pairs of lateral processes, which afford attachment to the end of the

Fig. III.



1, 2, 3, posterior outline of the sternum in *Procellaria gigantea*, *Diomedea exulans*, and *Crax alberti*; the shaded part is very thin, and the presence of a similar thin margin on the flattened ribs of the last-named conclusively shows that this margin results from a process of addition. 4, sternum of *Didunculus*, 5, of *Hesperornis* (cast), showing posterior lateral process; the last shows, like *Casuarius*, *Rhea*, and fig. 9, Plate XLII., an incomplete fusion, probably due to the same causes that have operated in widening the sternum during the establishment of the Avian type. (All C.C., reduced.)

a, *b*, *c*, sterna of 8 and 9 days' Chicks: *a*, shows abnormal persistence on the right side of rudimentary 8th rib attached to the 7th; *b* and *c*, dorsal and ventral aspects of sternum, showing incomplete keel and absence of median furcular apophysis.

large pectoralis major, are scarcely seen to project from the sternum, with the sternum of the Fowl or Tinamus, in which the long processes afford attachment merely to a few thin fibres of that muscle. Sterna of the Common Duck show much variation, with a tendency to fill up the sternum. The sternum of the Gull (*cf.* Plate XLIII. figs. 9 and 10) shows how the process of filling up takes place. In all the specimens examined except the one figured, the two processes were distinct, even in the earliest stages examined;

this one case shows the sternum on the way to become filled up. For other cases of apparent filling-up see diagrams 1, 2, and 3, fig. III.

4. Conclusion from the late date of its appearance and from the usual absence of any anterior median rudiment, pre-existing before the closure of the sternal halves:—that the keel is an outgrowth of the sternum of comparatively late phylogenetic date, and created for and by the attachment of the pectoral muscles.

5. Conclusion drawn from their late appearance in the embryo, later than the commencement of the keel:—that the median furcular apophysis, and the occasional median anterior sternal apophysis, are similarly structures of a late date, and entirely without connection with any ancestral interclavicle.

6. Conclusion from the comparison of embryo, of 4 days' incubation in the Ostrich, and 5 in the Gull and Chick, and from the comparison of the precoracoid in adult forms:—that the complex relations of the parts of the shoulder-girdle are not to be interpreted as indicating the existence of an interclavicle, but are rather due, in some types at least, to the existence of a rudimentary precoracoid.

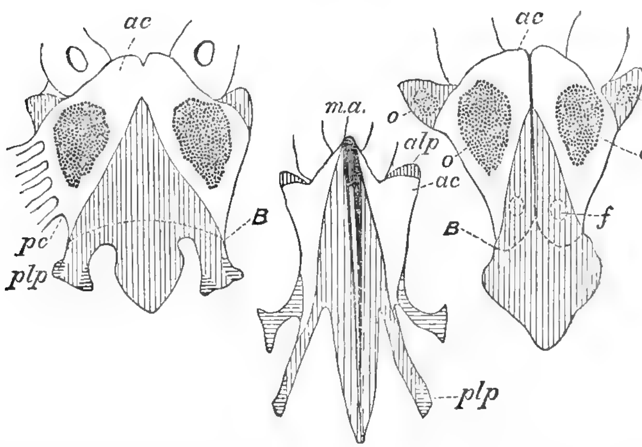
7. Conclusion drawn from comparison of Chick and Gull:—that the anterior lateral process of the sternum is not always of the same nature, being certainly an outgrowth of the costal sternum in the Ratitæ, while in other types it is apparently the rudiment of a former anterior extent of the costal sternum.

The progress of ossification in the sternum, as observed by L'Herminier, bears out the above conclusions. The "mesosternals" are the part earliest ossified, these centres occupying the *lateral* region; while the middle part (Parker's *Lophosteon*), which we have seen added to the costal sternum, as the median part of the mesosternum, in the case of the Ostrich, ossifies at a later date. It is to be remarked that in the Ostrich one pair of ossifications alone exists, the "mesosternals," above interpreted as the primitive costal part of the sternum; these centres are quite lateral in position. In the Goose, the lateral position of the ossific centres is still more remarkable; they are in fact quite marginal, occupying the region which Huxley calls the "costal process." These facts confirm the above theory, that the median part of the sternum is of later formation than the primitive costal bands.

In connection with the subject of ossification, it is necessary to deprecate the undue importance sometimes attributed to the existence of a special centre of ossification for the keel. Little phylogenetic value can be attributed to the existence of separate centres, except in the case of a bone which is in course of retrogression; in a bone like the Avian sternum, of still increasing importance, new centres tend to appear, representing not phylogenetic facts, but the positions of greatest strain and greatest strength in the bone at present. Among many familiar instances of the distinction that must be made in the two cases, are, on the one hand, the separate ossicles of the hyoid apparatus in the higher Mammalia, or the nucleus of the coracoid process in Man, and, on the other hand, the separate nuclei for the trochanters of the femur, or the epiphyses of long bones.

It will be seen that the above conclusions lead us to a much more complete and detailed idea of the nature of the parts of the sternum than at first sight it appeared possible to attain. If the attempt to form a complete theory of the origin of the sternum appears a rash undertaking, in the face of the opinion expressed by Prof. Parker, that our anatomical knowledge of the parts is as yet insufficient for teleological interpretation, it must be remembered that the study of five types has afforded a variety of new and interesting facts, and we may at least expect that wider investigation will shortly afford a true

Fig. IV.



Left figure, theoretical diagram of the Ostrich sternum; right figure, of Rhea; middle figure, of Chick.

The costal sternum is left white; *ac*, *pc*, indicate its anterior and posterior parts, produced by ribs atrophied in the adult; the metasternum is shaded vertically, also the anterior-lateral process. Additions of later phylogenetic date are shaded horizontally. In the Ostrich and *Rhea*, *B*, indicates the limit of the ossification in the adult; *o*, the dotted spaces, are the centres of ossification in the young; *f*, is a fontanel, scarcely closed by thin bone in some specimens.

solution of the problems under consideration, even if in the present instance the effort to attain it is unsuccessful.

The theoretical construction of the sternum thus adopted will be best explained by reference to the above diagrammatic representation of the sternum in Fig. IV., and to the following tabular classification of the parts of the Avian sternum.

That the *boundaries* of ossification have not always a phylogenetic significance is clearly shown in the Ostrich. Comparison of the embryos (Plate XLII.) shows that the primary costal halves of the sternum become united by cartilage developed in the median line, yet the line of ossification is as indicated in the diagram.

Tabular Classification of parts of the Sternum

A. Part common to *Sauropsida* and *Mammalia*:—
Costal sternum, arising in two bands; connected with sternal ribs in the adult, but often losing its connection with ribs which took part in its early formation.

B. Part common to *Ratitæ* and *Carinatæ*, but seen to be wanting in early embryos of the former, never of the latter; it is thus seen in process of formation in the former, as indicated by its partly cartilaginous condition in the adult:—*Metasternum*.

C. Part apparently common to both Ratitæ and Carinatæ, but really of different origin:—
Anterior lateral process; seen added to the costal sternum in the *Ostrich*, formed by atrophy of anterior ribs in the *Chick* and *Gannet*.

D. Part absent in Ratitæ, but common to all Carinatæ:—
Keel; the median ventral outgrowth of B.

E. Part common to some Ratitæ (Ostrich, and indicated in *Rhea*) and the majority of the Carinatæ:—
Posterior lateral process.

F. Parts variant in families and genera of Carinatæ:—
Accessory processes of *Metasternum*.
Rostrum or anterior median sternal apophysis.
Xiphoid ends of posterior processes.

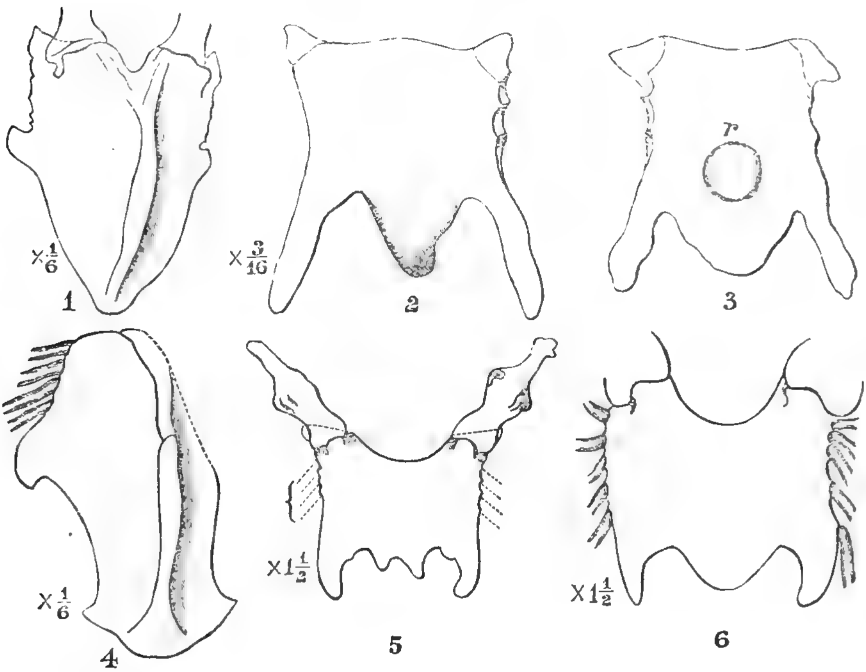
Variations of the Posterior Lateral Process.

The posterior lateral process of the sternum, if the value above assigned to it be correct, ought to be found a constant feature of the sternum of birds. Comparison of types shows that this is the case: the birds that have a sternum without processes are few, the most familiar instances being the Crane and the Goose. It must not, however, be supposed that whenever we find a posterior lateral process, this represents the primitive process as seen in the Ratitæ; for example, we find in the Spheniscidæ, &c. (*cf.* figures given by Watson, 'Challenger' Report on the Spheniscidæ, and by Forbes, Report on the Tubinares), variations in the shape of the posterior processes which suggest that they have been formed by completion of the growth of the sternum. In such cases, however, the primitive process must form a part of the new one.

A secondary process exists in a large number of birds; and the study of development has already shown that such an accessory process may be added either on the external side of the primitive postero-lateral process, as in the Chick, or on the inner side, as in the Gull. In the Pheasants, as well as in the Gallinaceæ, it is doubtless formed as in the Chick: in many other birds, for example in the Bustards, Curlews, Plovers, &c., its exact origin is at present unknown.

It is worthy of remark that the accessory process, when present at all, is not conspicuous in birds of archaic types, while the large posterior-lateral process is well marked; witness the sternum in the *Hesperornis, Dinornis, Dodo, Apteryx, Solitaire,* and *Didunculus* (*cf.* fig. V.). Other noteworthy instances of a single posterior-lateral process, probably of primitive type, are given in *Tinamus, Herodias, Spheniscus, Aptenodytes,* and in most families of the *Passeres,* in which latter the shape of the process shows a tendency towards the filling up of the sternum.

Fig. V.



Archaic types, with posterior-lateral processes.

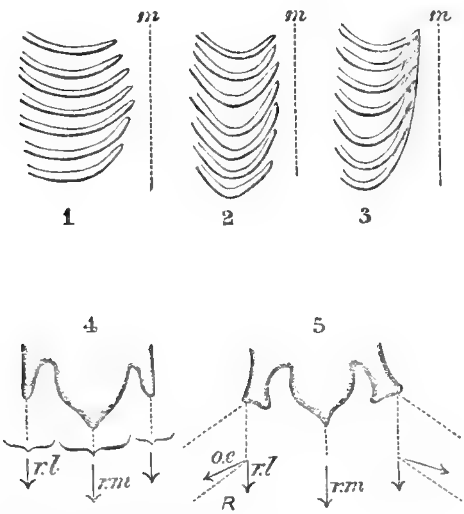
1, Sternum of *Didus ineptus*; 2, of *Dinornis crassus,* from N. Otago, New Zealand; 3, of *Dinornis,* from Hector Range, New Zealand; 4, of *Pezophaps solitaria*; 5, of *Apteryx oweni*; 6, of *A. mantelli.* (All C.C., reduced.)

r, is a fontanel imperfectly closed.

Finally, it is to be remarked, if the reference to a mechanical theory of the origin of the posterior processes seems to require apology, that the very existence of the sternum may perhaps be explained by a mechanical theory. The ends of the ribs fuse, as Rathke showed, into a continuous band. Now it is not improbable that this is primarily due to the establishment of lungs. The difference between the capacity of the thorax in inspiration and expiration necessitates that the extra length of each rib shall be packed in a loop during the latter position (*cf.* fig. VI., 2). Now in the embryo, the thorax being in the position of rest, these loops lie close together. Thus it is easy to see how the original fusion of rib-ends may have taken place.

Further, the union of the two halves of the sternum is rendered imperative by the strain involved in the moving of the fore limbs, which calls for strength in the median line.

Fig. VI.



1. Ribs in the position of inspiration.
2. Ribs at the end of expiration, packed into loops.
3. The primitive costal band; *m*, median line.
4. Theoretical diagram of the posterior border of the sternum, as influenced by no muscle but the rectus; *r.l.*, *r.m.*, strain of the rectus medianus and rectus lateralis, producing lateral and median processes. This corresponds with the condition in the Ostrich of 15 days' incubation.
5. Lateral process modified by the lateral strain of *o.e*, the obliquus externus, passing from the sternum to the side of the abdominal region. *R*, resultant of its strain and that of the rectus lateralis, acting at the outer point of the process. This diagram corresponds with the older Ostrich embryos.

In the Ostrich, owing to the extreme smallness of the pectoral muscles, the mechanical relations of the posterior border of the sternum are simple compared with those existing in other birds.

The researches described in the above paper were undertaken at the instance of Dr. Gadow, whom I have to thank, not only for constant help and criticism throughout my work, but also for nearly the whole of the material used. I must likewise record my thanks to Mr. Sedgwick for the use of sections of the Chick belonging to the Morphological Laboratory, Cambridge; and to Miss Clarke (lately Demonstrator of Biology at Newnham College, Cambridge) for part of the material used and for kindness in literary help.

Literature.

1. L'Herminier. Recherches sur la Marche de l'ossification dans le Sternum des Oiseaux, pour faire suite aux travaux de

MM. Cuvier et G. de St.-Hilaire; présentées à l'Académie des Sciences, 1830. (Abstract in 'Les Annales des Sciences Naturelles.')

2. C. G. Carus. Lehrbuch der Zootomie (pp. 158, 179). Leipzig, 1834.
3. C. Gegenbaur. (For first view.) Grundzüge der vergl. Anat. 1859.
4. Harting. L'Appareil Episternal des Oiseaux. Utrecht, 1864.
5. C. Gegenbaur. (For second view.) Untersuchungen zur vergl. Anat. der Wirbelthiere: 2 Heft, Schultergürtel der Wirbelthiere. Leipzig, 1865.
   Grundriss der vergl. Anat. 1877.
6. W. K. Parker. A Monograph on the Structure and Development of the Shoulder-Girdle and Sternum in the Vertebrata. Ray Soc. 1868.
7. T. H. Huxley. Manual of the Anatomy of Vertebrated Animals. London, 1871.
8. Newton and Parker. Encycl. Brit., article "Birds."
9. A. Götte. Beiträge z. vergleich. Morphol. d. Skeletsystems d. Wirbelthiere. Brustbein und Schultergürtel. Archiv für mikr. Anat. vol. xiv. 1877.
10. C. K. Hoffmann. Beiträge z. vergleich. Anat. d. Wirbelthiere. Niederländische Archiv f. Zool. vol. v. 1879.
11. A. Sabatier. (For theory of Avian precoracoid.) Comparaison des ceintures et des membres antérieurs et postérieurs d. la Série d. Vertébrés. Montpelier, 1880.
12. G. Ruge. (For homologies of Mammalian interclavicle so-called.) Untersuch. über Entwick. am Brustbeine d. Menschen. Morphol. Jahrbuch, vol. vi. 1880.
13. F. M. Balfour. Comparative Embryology. Vol. ii. ch. xviii., xx. 1881.
14. P. Albrecht. (For homologies of so-called interclavicle of Mammalia.) Sur les Eléments Morphologiques du Manubrium du Sternum chez les Mammifères. Bruxelles, 1884.

EXPLANATION OF THE PLATES.

The letters C.C. here and in the woodcuts indicate that the specimen figured is in the Collection at the University Museum of Zoology, &c., Cambridge.

General Lettering of all the Plates.

c. Coracoid.
p.c. Precoracoid.
sc. Scapula.
m. Equivalent of the mammalian manubrium sterni.
m.s. Metasternum.
h. Head of humerus.
a.l.p. Anterior-lateral process.
p.l.p. Posterior-lateral process.
r.m. Median band of the rectus abdominis muscle.
r.l. Lateral band of the rectus abdominis muscle, attached to *p.l.p.*
y. Line of undifferentiated muscle, bordering on the yolk-sac, and curved to make room for it.

Plate XLII. *Diagrams of* Struthio.

Fig. 1. *Left half of shoulder-girdle of 4 days' embryo*: *c.*, *p.c.*, and *sc.* are separate; *h.* has been somewhat displaced towards the left of the body in dissection.

2. *Primitive muscular bands of 4 days' embryo*, 8 in number. The dotted lines mark the position of the corresponding ribs as ascertained by dissection. Of the six sternal ribs of a later stage, the two anterior only are united, confirming Rathke's statement as to the anterio-posterior coalescence of the primitive costal bands.

Sterna (of natural size, excepting figs. 3 and 9).

3. *Of 7 days' embryo*, seen from inside. *m.* is clearly shown, *c.* being not yet attached, also the primitive condition of *p.l.p.* and the division of the rectus into two parts (*r.m.* broken, and *r.l.* attached to *p.l.p.*), united by thinner and less differentiated muscular tissue. There are 6 sternal ribs, and the two following are still long.
4. *Of 10 days' embryo*: *c.* is attached, *p.l.p.* elongated.
5. *Of 15 days' embryo.* The halves of the sternum are united; *m.s.* and *a.l.p.* have been added, and the two posterior ribs shortened.
6. *Of 21 days' embryo.* The xiphoid end has been added to *p.l.p.*; *a.l.p.* is fully elongated; *l.* is the thin ligament uniting the coracoids and sternum.
7. *Of 25 days' embryo.* The 6th sternal rib has lost its sternal attachment; but 7 *a* shows not only the 6th but also the next rib still long on the right side; *l*, ligament.
8. *Of 27 days' embryo.* The 6th sternal rib having greatly shortened, the adult condition is now attained, mapped out in cartilage.
9. *Of adult Ostrich*: *p.c.* shows its occasional condition of atrophy; *m.* is incompletely closed, a condition normal in *Casuarius* and *Rhea*, but not in *Struthio.* The cartilaginous *m.s.* and *p.l.p.* have been lost in maceration. (Reduced.) C.C.

Plate XLIII.

Fig. 1. *Rhea*: sternum of young bird, with unfused halves, $\times\frac{1}{4}$. C.C.

2. *Rhea*: sternum of adult bird, with halves partly fused, $\times\frac{1}{4}$. (In very old birds the halves are almost completely fused.) C.C.
3. *Struthio*: 4 days' embryo ($\times 1$); showing length of tail and smallness of fore limb compared with chick of same age.
4. *Struthio*: 7 days' embryo ($\times 1$); showing division of fore limb into three digits. 4 *a.* Fore limb of Gannet at same stage ($\times 2\frac{1}{2}$).
5. *Struthio*: 10 days' embryo ($\times 1$); back view.
6. *Struthio*: 10 days' embryo ($\times 1$); side view.

   Showing appearance of feather-tracts, five in number, viz. those of the dorsal surface, those of the ventral surface, of the thigh, the wing, and the head and neck.
7. *Struthio*: 15 days' embryo ($\times 1$); showing spread of the feather-tracts and establishment of the scales on the foot.
8. *Larus*: 5 days' embryo ($\times 5$): left shoulder-girdle (ventral side), showing struthionic character of coracoid; *cl.*=clav.; *p.c.*=precor.; *y*=supplementary tissue of the coracoid; *x*=separate centre for median furcular apophysis.

9, 10. *Larus*: 15 days' embryo; posterior border of sternum ($\times 1$), showing processes. In 10 the two processes are united, a condition never seen in any younger stage.

11. *Larus*: 12 days' embryo, showing six sternal ribs and three bands in the rectus muscle, a struthionic condition, to be noted in connection with the struthionic character of the precoracoid.

Plate XLIV.

Fig. 1. Coracoid of *Diomedea exulans.* Showing *p.c.*=precoracoid of Sabatier; *cor.ep.* epiphysis of the coracoid (Parker's precoracoid); *p.p.c.*=posterior process of the coracoid; *a.* paired anterior apophysis of the sternum. C.C.

Fig. 2. Shoulder-girdle of late 5 days' chick, showing relations of *cl.*=clavicle and *cor.*=coracoid. The coracoid has a flattened shape; the scapula is removed.

3. The same, *in situ*.

4 5. Shoulder-girdle of two 5 days' chicks (right and left). Showing clavicle adjoined to coracoid, scapula quite free; ventral surface. *Erratum*: R. and L. are reversed in the diags., and *sc.* is put for *cl.* in fig. 5.

6. Six days' chick, showing (1) absence of interclavicle, (2) fused coraco-scapular plate, removed from position of dotted line, (3) elongated clavicle; also (4) rectus attached to clavicle (*cf.* fig. 9).

7, 8. Right coracoid of *Casuarius*, showing the foramen or incisura coracoidea, which in *Struthio* lies near the inner margin of the coracoid. The area internal to it is probably a precoracoid (not identical with that of *Struthio*); *cf.* fig. 1, also woodcut diagram of shoulder-girdle of Chick. C.C.

9. *Uria troile*: 7 days' embryo, showing clavicles closed before the sternum and giving attachment to rectus muscle, *r*.

10. *Uria troile*: about 15 days': *r*1, external rectus continuous with pectoralis major; *r*2, main sheet of rectus; *r*3, internal thin sheet of rectus; *s*=supracoracoideus (or pect. minor).

11. The same, showing attachment of *r*3 on the *dorsal* side of the sternum.

12. The same, showing attachment of *r*3 nearer the margin, at a later stage.

13, 14. The same, ribs of 7 days' embryo; 13 shows *m'*, traces of the primitive intercostales externi, dissected out.

15. *Dromæus*, showing relations of clav., precor., and *f*, for. cor., in young bird. C.C.

16. Coracoid of adult bird: *f*, foramen; *g*, posterior border of coracoid. C.C.

PLATE XLV.

Fig. 1. Chick, 6–7 days' incubation, showing rectus (*r.*) continuous with supracoracoideus (*p. min.*); $\times 2\frac{1}{2}$.

2. Embryonic sternal ribs of late 6 days' chick, *eleven* in number, the early form of the posterior processes is also shown.

3. Late 6 days' chick, showing *m'*, primitive bands of the intercostales externi, and wedge-shaped upper part severed from rectus band by growth of sternum—removed from ×. Parts of the rectus=*r.* and *r.l.*; $\times 4$.

4, 5. Occasional separate centre, *k*, for keel in 7 days' chick.

6. The wedge-shaped rectus band, together with (*m'*) three anterior muscle-bands (primitive intercostales externi), of late 6 days' chick.

7. The same at a rather later stage (very early 7 days' chick); $\times 4$.

8. Last trace of the three anterior muscle-bands, in 7 days' chick; $\times 4$.

9. Normal sternum of 6 days' chick, showing commencement of external process, and (*t*) thin region towards median line: *cf.* fig. 8.

10. Abnormal sternum of 6 days' chick, showing a process of the sternum anterior to the coracoid, four rudiments apparently of anterior ribs, and the muscle-bands belonging to each, turned over.

11. Five days' chick, showing (*x*) lateral bands of muscle attached to lower jaw; upon the complete closure of the pericardial cavity these unite to form the median band seen in figs. 3, 6, and 7.

12. Sternum of 5 days' chick (broken by needle), showing masses of differentiating mesoblast alternate with the ribs, possibly indicating a complex series of costal centres in the sternum comparable with what Albrecht calls "hemisternebrals" in mammals; and four anterior ribs attached to the vertebral column, the posterior ones free.

13. Gannet, Stage 1. *r*=rectus muscle.

14. Gannet, Stage 2. *c.s.*, mass of sternum, showing depression for attachment of coracoid; *k*=keel; *m'*=three rudimentary muscle-bands; *hy.*=thick folds of hypoblast of the throat, which afterwards form the thyroid glands.

15. Gannet, Stage 3; dorsal aspect. *k*=keel; *l* and *l'*=ligaments.

16, 17. Gannet, Stage 4. L, ligament.

18. Posterior margin of sternum of bird just hatched ($\times$ 1).

November 3, 1885.

Prof. W. H. Flower, LL.D., F.R.S., President, in the Chair.

The Secretary read the following reports on the additions made to the Society's Menagerie during the months of June, July, August, and September, 1885:—

The total number of registered additions to the Society's Menagerie during the month of June was 172, of which 78 were by birth, 59 by presentation, 9 by purchase, 21 by exchange, and 5 were received on deposit. The total number of departures during the same period by death and removals was 103.

The following are of special interest:—

1. A Spurred Chameleon (*Chamæleon calcarifer*), presented by Major J. W. Yerbury, R.A. Major Yerbury writes from Aden (April 8th, 1885) that this fine Chameleon was caught a few miles from Aden. He had previously sent an example of this Chameleon to the British Museum, so that Mr. Boulenger has been able to determine its specific name. The typical example described by Dr. Peters ('Reise nach Mossambique,' Zool. vol. iii. Amph. p. 22, Taf. iv. *a*) is said to have been obtained in Madagascar; but it can hardly be believed that a Chameleon of the same species can occur in two such different localities.

2. A fine series of Australian Reptiles, received in exchange from the Zoological Society of New South Wales on June 11th, and containing examples of two species of Lizards and six species of Snakes; of the latter, three species (viz. *Diemenia psammophis*, *Hoplocephalus curtus*, and *Dendrophis punctulatus*) are new to the collection.

3. A female of the Pleasant Antelope (*Tragelaphus gratus*) from the Gaboon, purchased June 18th. This scarce Antelope, remarkable for its elongated hoofs, whereby it approaches *T. spekei*, has lately been figured and described in the Society's 'Proceedings' (P.Z.S. 1880, p. 253, pl. xliv.; 1883, p. 34, pl. viii.) from examples living in the Jardin des Plantes at Paris. The present example is the first of this species received by the Society.

4. Twelve Cascaduras (*Callichthys littoralis*) from Trinidad, presented by Mr. J. Franks Chittenden, of Port of Spain, C.M.Z.S., and received June 23rd. Mr. Chittenden writes that in Trinidad these fishes are considered one of the delicacies of the table, and have a constant place in the market.

The registered additions to the Society's Menagerie during the month of July were 106 in number; of these 66 were acquired by presentation, 3 by purchase, 29 by birth, and 8 were received on deposit. The total number of departures during the same period by death and removals was 91.

The total number of registered additions to the Society's Menagerie during the month of August was 121; of these 65 were acquired by presentation, 2 by purchase, 27 by birth, 13 were received on deposit, and 3 in exchange. Eleven young Pheasants, received during the month, were bred from eggs laid in the Society's Gardens, and sent into the country to be hatched. The total number of departures during the same period by death and removals was 98.

The collection of Javan animals, presented by Dr. F. H. Bauer, of Buitenzorg, Java, C.M.Z.S., is important, as containing examples of an Owl (*Bubo orientalis*) and of three Reptiles and a Batrachian, all new to the Society's series.

The total number of registered additions to the Society's Menagerie during the month of September was 141; of these 77 were acquired by presentation, 15 by purchase, 42 were bred in the Gardens, and 7 were received on deposit. The total number of departures during the same period by death and removals was 89.

Mr. Sclater placed on the table the skull of the Tapir received by the Society, May 25th, 1878, and described and figured by him (P. Z. S. 1878, p. 632, plate xxxix.) as *Tapirus roulini*. The animal had died on the 2nd June, 1884. It was of the male sex, and had bred with the female *Tapirus americanus* received Jan. 16th, 1873. Now, however, that the skull could be examined, it was evident that the supposed *Tapirus roulini* was not of that species, but merely a dark variety of *Tapirus americanus*. After such evidence of variation, Mr. Sclater had come to the conclusion that the Tapir from Venezuela, presented by Fritz Zurcher, Esq., August 13th, 1881 (see P. Z. S. 1882, p. 391, plate xxiii.), which he had referred with some doubt to *Tapirus dowii*, was also, probably, merely a form of the variable species *Tapirus americanus*.

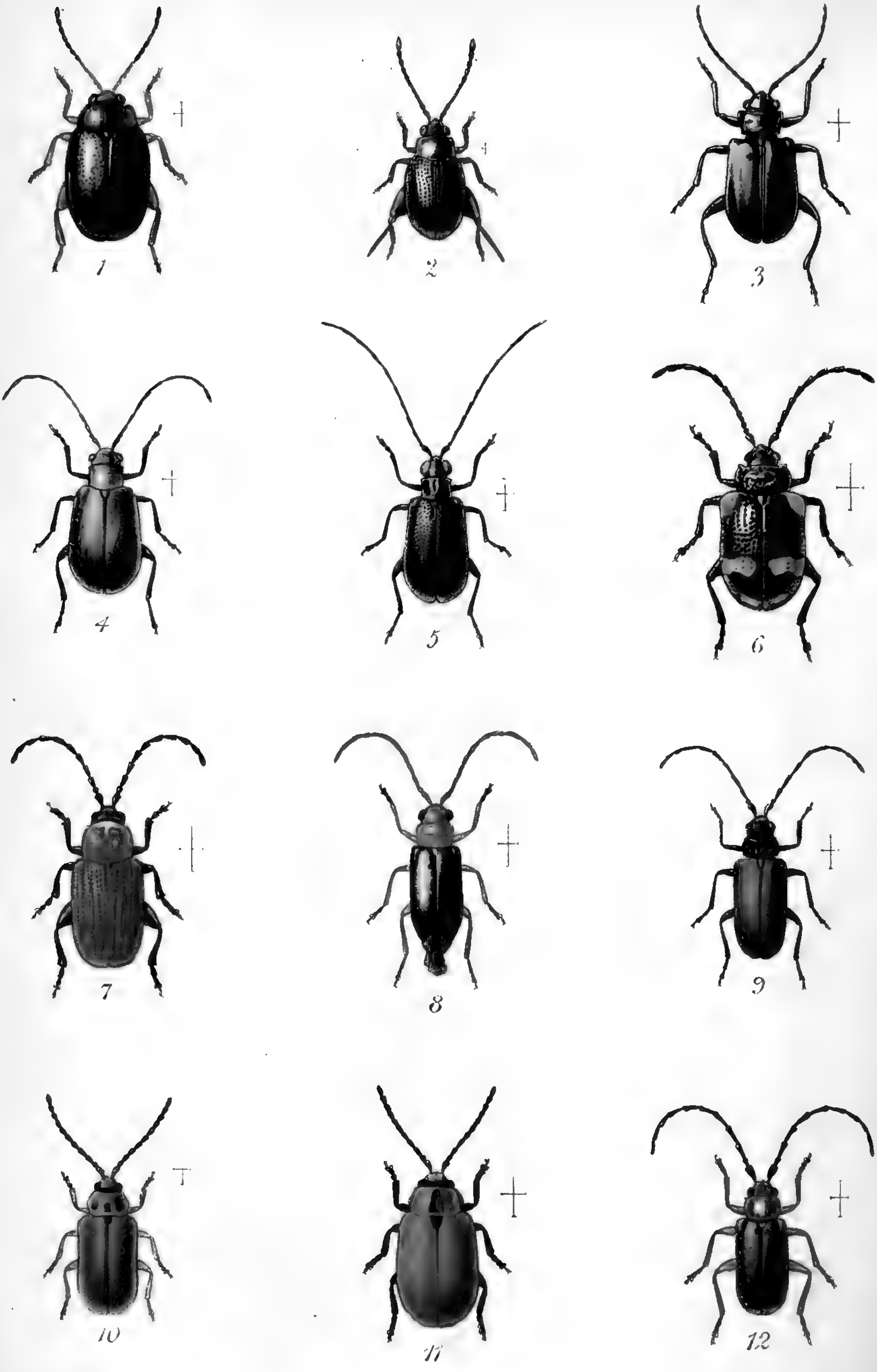
In future editions of the 'List of Vertebrate Animals,' Mr. Sclater proposed to refer all these individuals to *Tapirus americanus*, and much regretted that the difficulty of determining living animals with correctness had led him into these serious errors.

The following extract was read from a letter addressed to the Secretary by Dr. F. H. Bauer, C.M.Z.S., dated Buitenzorg, July 16th, 1885:—

"I have tried to get some more specimens of the *Ptychozoon homalocephalum*[1], but am sorry to say I have not succeeded. Last November I obtained one, but in the cold season it was impossible to despatch it.

"It appeared to be a female, for only a few days after its capture it laid two eggs in the box in which it was kept. After several months the eggs were still *in statu quo*, and I believed them to be

[1] See P. Z. S. 1872, p. 589.



W. Purkiss lith. Hanhart imp.

NEW PHYTOPHAGOUS COLEOPTERA.

unimpregnated, till at last, in the middle of May, from one of them issued a living young one, and two days afterwards another from the other egg in the same manner.

"I believe such a long period of incubation very extraordinary and noteworthy. I answer for the authenticity of this fact. Both young ones died soon, probably for want of suitable food. I put them in spirit, along with the mother, who died much emaciated, about the same time. If you think them interesting, I shall be happy to send them. Perhaps nowhere do they possess so young specimens of this species. The characteristic plaits of the skin along the body and tail are already clearly discernible."

The following extract was read from a letter addressed to the Secretary by Mr. J. Caldwell, C.M.Z.S., dated "Museum, Port Louis, September 3rd, 1885."

"I have only a few minutes before the mail leaves, to inform you that the day before yesterday one of my collectors found a hitherto unknown deposit of Dodo bones. I shall be off in a few days to examine it. There is no doubt about the few specimens he brought me, as the upper mandible is precisely the same as that figured in Strickland's Monograph, plate viii., but a trifle larger. I have given orders not to have any of the remains disturbed till I reach the spot myself, so that there may be no mixing up of the remains of separate birds, if we should be fortunate enough to find anything like an entire specimen. The locality is in the south-west of the island in a small cavern."

Prof Bell exhibited a particularly fine specimen of the Decapod crustacean *Alpheus megacheles*, received from Mr. Spencer, who had collected it at Herm, Channel Islands, and made some remarks on it, and on the presence of *Sphærechinus granulosus* at that island.

The following papers were read :—

1. Descriptions of the Phytophagous Coleoptera of Japan obtained by Mr. George Lewis during his Second Journey, from February 1880 to September 1881.—Part II. *Halticinæ* and *Galerucinæ*. By Martin Jacoby[1].

[Received July 22, 1885.]

(Plate XLVI.)

The present paper deals with the species of *Halticinæ* and *Galerucinæ* obtained by Mr. George Lewis during his second journey in Japan. As was to be expected, the collection contains a greater number of

[1] Continued from p. 211.

new forms amongst these families than of those genera which are included to the end of the true *Chrysomelinæ*, and further researches will no doubt greatly increase their number. A certain number of species which are present only in single specimens seemed to me to be so closely allied to certain European forms, especially to species of the genus *Longitarsus*, which contains already a great many very difficult species, that their description would have only increased the difficulty of determination, and I have thought it best to abstain from describing them till more material was at hand. I have added a list of the Phytophagous Coleoptera of Japan (to the end of the Galerucidæ) as far as at present known, so many additions having lately been made, that a clearer idea may be gathered of their number. There is, however, little doubt that this list will be in future greatly extended, and that especially still more species will be found which are inhabitants of Japan and the northern parts of Asia on one side, and the Malayan region on the other.

Genus Mantura, Stephens.

Mantura japonica, sp. nov.

Black below; the basal joints of the antennæ, tibiæ, and tarsi ferruginous; above dark blue; thorax strongly punctured; elytra deeply punctate-striate, the interstices flat.

Length 1 line.

Head remotely but deeply punctured; antennæ extending beyond the base of the thorax, the first four joints fulvous, the basal one stained with bluish-black above, the terminal joints entirely of that colour. Thorax twice as broad as long, the sides straight at the base, rounded towards the apex, rather strongly deflexed; a distinctly impressed longitudinal groove extends upwards from the sides of the base to nearly the middle; disk covered with deep and strong punctures, more closely at the sides than at the middle. Elytra rather convex, subcylindrical, regularly and deeply punctate-striate.

Hakodate.

Allied to *M. obustata*, Gyll., but the head and thorax much more strongly punctured, which gives a more rugose appearance to these parts; the punctures of the elytra are also more closely approached and of a more rounded shape. As these characters are the same in all the specimens before me, I thought it best to separate them specifically.

Mantura fulvipes, sp. nov.

Black below; the four basal joints of the antennæ, and the legs fulvous; above blackish-blue; thorax coarsely punctured; elytra strongly punctate-striate.

Length 1 line.

Head deeply and rather closely punctured; terminal joints of the antennæ thickened, pitchy black; four lower joints fulvous. Thorax transverse, very convex, the sides strongly rounded and dilated; surface closely foveolate-punctate at the sides, more remotely punctured at the disk, the latter with a more or less distinct central longitudinal smooth space, the sides at the base impressed with a short but deep fovea. Scutellum extremely small. Elytra convex, subcylindrical, the punctuation strong and regularly striate, the interspaces not raised. Legs entirely fulvous.

Kumamoto.

The small and convex shape of this species, in connection with the strong and close punctuation of the thorax and the entirely fulvous legs, will assist in separating it from its allies. The sides of the thorax are also much more rounded and dilated than in any species with which I am acquainted.

Genus Crepidodera, Chevr.

Crepidodera lewisi, sp. nov.

Oblong, fulvous; terminal joints of the antennæ, apices of the femora, tibiæ, and tarsi black. Thorax impunctate. Elytra extremely finely punctate-striate.

Length 2–2½ lines.

Head impunctate, the frontal tubercles broad, divided anteriorly only, contiguous posteriorly; carina acutely raised; labrum and palpi obscure piceous. Antennæ half the length of the body, the four lower joints fulvous, the rest black, third and fourth joints equal in length, one half longer than the second. Thorax not more than one half broader than long, the sides very slightly rounded, the angles distinct but not produced, the anterior ones slightly oblique, the basilar sulcation broad and moderately deep, but bounded at the sides by a deep longitudinal groove, the upper end of which extends slightly beyond the sulcation; surface entirely impunctate. Elytra slightly broader at the base than the thorax, very minutely and rather irregularly punctate-striate, the punctured rows rather distantly placed and often consisting of double punctures, the apex scarcely visibly punctured. Legs and tarsi black, the base of the femora fulvous.

The exact locality of this species, which belongs to the group including *C. transversa*, *C. impressa*, &c., is not given. It may be that *C. lewisi* is identical with *C. obscuritarsis*, Motsch., or at all events closely allied, but the colour of the antennæ and legs is different. The punctuation of the elytra is rather variable, consisting in more or less closely approached extremely fine rows of punctures, which here and there are united in pairs but for the most part single and irregularly placed. The species may be recognized principally by the colour of the antennæ, which have the four first joints fulvous only, the rest being black, the latter colour being that also of the tibiæ and tarsi.

Crepidodera recticollis, sp. nov.

Oblong-ovate, narrowed behind, entirely pale fulvous; thorax impunctate, the sides straight; elytra finely punctate-striate.

Length 1 line.

Head impunctate, the frontal tubercles rather obsolete; antennæ more than half the length of the body, entirely fulvous, the second and third joints short and equal, the following joints not much longer. Thorax about twice as broad as long, the sides straight, the anterior angles oblique, surface rather convex, the basilar groove deep and bounded at the sides by an equally deep longitudinal groove; within the former a transverse row of punctures is placed; the rest of the disk is impunctate. Scutellum very small. Elytra narrowed and pointed at their apices, finely and regularly punctate-striate, the punctuation nearly absent at the apices. Legs and underside fulvous.

Kashiwagi.

Much smaller than *C. lewisi*; the sides of the thorax straight, the punctuation more regular, and the antennæ and legs entirely fulvous. From *C. ferruginea*, Scop., the species is distinguished by the impunctate thorax, the finer punctuation of the elytra, and the smaller size.

Crepidodera lævicollis, sp. nov.

Ovate, very convex, dark fulvous; antennæ and legs light fulvous; thorax impunctate; elytra very finely punctate-striate, the interstices flat.

Length $1\frac{1}{2}$ line.

Head impunctate, the frontal tubercles very obsolete, the space between the antennæ with a rather deep groove; antennæ entirely light fulvous, more than half the length of the body, the third joint one half longer than the second. Thorax transverse, the sides rounded at the middle, somewhat narrowed at the base; the basilar groove straight, deep, and bounded at the sides by a still deeper longitudinal groove; surface entirely impunctate, with the exception of a few punctures within the basilar sulcation. Elytra very convex, the punctuation fine and here and there irregular on account of some extra punctures, the striæ more obsolete but yet visible to the apex, the latter of somewhat lighter colour than the rest of the surface; the first joint of the posterior tarsi longer than the two following joints together.

Oiwake. A single specimen.

This species may be compared with *C. exoleta*, Fabr., and *C. interpunctata*, Motsch., from both of which it differs sufficiently to merit a specific name; the interstices are here flat, not convex as in *C. exoleta*, in which the head and thorax are also finely punctured. The impunctate thorax and darker colour in general separate the present species from that of Motschulsky; the larger size and rounded sides of the thorax from *C. recticollis*.

Crepidodera acuminata, sp. nov.

Oblong, narrowed behind, fulvous; head and thorax impunctate; elytra finely and regularly punctate-striate.

Length 1 line.

Head impunctate, the frontal tubercles obsolete but visible, nearly contiguous; antennæ more than half the length of the body, entirely fulvous, the second and third joints short and equal, fourth slightly longer; thorax not much more than one half broader than long, the sides narrowed at the base, rounded at the middle, the anterior angles oblique, the basilar sulcation deep and well limited laterally by a longitudinal groove, surface impunctate. Elytra strongly narrowed behind, the punctured striæ very regular and fine, still less strongly marked at the apex; the first joint of the posterior tarsi as long as the two following joints together.

Nikko. A single specimen.

Narrower, less convex, and of lighter colour than *C. lævicollis*, the thorax longer and less transverse, the striæ at the elytra much more regular and composed of single punctures only. The shape of this species is very pointed posteriorly, and the sides of the thorax are concave near the base, both characters which will assist in the recognition of the present insect.

CREPIDODERA JAPONICA, sp. nov.

Black or piceous; thorax strongly punctured within the basilar groove; elytra distinctly punctate-striate.

Length $1\frac{3}{4}$–2 lines.

Head impunctate, deeply grooved between the eyes; frontal tubercles elongate, strongly raised, fulvous or piceous; palpi dark fulvous; antennæ two thirds the length of the body, black, the apices of the basal joints stained with fulvous, third and fourth joints of equal length. Thorax subquadrate, slightly broader than long, the sides rounded before the middle, constricted near the base, the latter with a deeply impressed transverse groove, limited at the sides by a perpendicular sulcus; surface rather convex, the disk impunctate, the lateral margin accompanied by a deep row of punctures which extend also across and within the basilar groove. Elytra with distinct and regular rows of punctures, which are a little less deeply impressed near the apices, the latter being of a somewhat paler colour than the rest of the surface. Legs covered with yellowish pubescence.

Nikko.

The rather large size and entirely black or piceous colour will assist in distinguishing this species. The transverse groove of the thorax extends nearly to the sides, is strongly punctured, and not so well bounded laterally by a perpendicular groove as is the case in most of the species in this genus. The frontal tubercles also are very strongly developed, and sometimes of an obscure fulvous colour.

CREPIDODERA BIMACULATA, sp. nov.

Fulvous; antennæ, tibiæ, and tarsi black; thorax impunctate; elytra finely subgeminate punctate-striate, fulvous, each elytron with an obscure fuscous spot near the apex.

Length 2 lines.

Head finely transversely strigose at the vertex, impunctate, the frontal tubercles strongly raised, elongate, and bounded behind by a deep transverse groove. Antennæ as long as the body, black, the first joint somewhat angulate near the apex, the second short, third and fourth joints of equal length. Thorax about one half broader than long, the sides rounded before the middle and narrowed towards the apex; basilar sulcation deep, straight, and bounded at the sides by a perpendicular groove; rest of the surface entirely impunctate. Elytra slightly wider at the base than the thorax, parallel, slightly narrowed towards the apex, the shoulders limited within by a longitudinal depression, the punctured striæ fine and regular, the interstices with a few very minute punctures; at the sides near the apex an oblong obscure fuscous spot is placed; femora fulvous; tibiæ and tarsi black.

Subashiri. A single specimen.

The punctures of the elytra are very distantly placed, and form about four double rows, which become more obsolete at the sides and the apex.

Crepidodera chloris, Foudr.

The Japanese specimens before me do not differ in any way from the European form; the species has not hitherto been recorded from Japan.

Genus Liprus, Motsch.

Liprus nigritus, sp. nov.

Black, tibiæ and lower joints of the antennæ testaceous. Thorax rugose-punctate. Elytra punctate-striate, the interstices obsoletely costate.

Length $1\frac{3}{4}$ line.

Head impunctate, black, shining, the space between the eyes slightly depressed, the frontal tubercles very small. Antennæ very nearly as long as the body, the six lower joints pale fulvous, the rest black, the second and the two following joints slightly increasing in length. Thorax square-shaped, with a distinct transverse groove parallel and at some distance from the posterior margin, surface finely rugose throughout. Elytra deeply depressed below the base, regularly and distinctly punctate-striate, the interstices when viewed sideways costate and sparingly covered with white pubescence. Legs testaceous, the femora piceous; posterior tibiæ slightly curved.

Oyana. Four specimens.

Chapuis, in his 'Genera des Coléoptères,' has made no mention of the genus *Liprus*, which was probably unknown to him. I must refer here to my remarks about the genus in the 'Annals of the Genoa Museum,' vol. ii. 1885, p. 71. The open coxal cavities would place *Liprus* near *Diphaulaca* and *Lactica*, from both of which it differs, however, in most other structural characters, notably in the perpendicular sides of the elytra, a peculiarity unknown amongst numerous other genera of *Halticinæ*. I am not quite certain whether the species described here is not the *L. punctato-striatus* of Motschulsky, from which, according to the description, it differs in the colour of the antennæ and legs, and also in the rugosely-punctured thorax. The colour of the latter and that of the head separates the species from *L. hirtus*, Baly.

Liprus suturalis, sp. nov.

Pale fulvous; thorax distinctly punctured; elytra deeply punctate-striate, the interstices costate, fulvous; the sutural margin abbreviated near the apex, black, the costæ with yellowish rather long and stiff hairs.

Length 1 line.

Fukushima. A single specimen.

Rather smaller than the smallest specimens of *L. hirtus* and *L. nigritus*, with which the present species cannot be confounded on account of the strongly raised elytral costæ and their narrow black sutural margin. The antennæ also are shorter, and the thorax seems less transverse and more elongate. It may be, however, that *L. suturalis* is only a small and differently coloured variety of *L. nigritus*.

Liprus minutus, sp. nov.

Pale testaceous, finely pubescent; thorax rugose-punctate; elytra punctate-striate, the interstices costate, testaceous, a spot behind the middle of each elytron piceous.

Length $\frac{3}{4}$ line.

Head impunctate, the frontal tubercles obsolete. Antennæ closely approached, testaceous, two thirds the length of the body; the second joint as thick as the first, but less than half its length, the two following joints scarcely longer but much thinner, the rest gradually but slightly thickened. Thorax subquadrate, one half broader than long, the sides perfectly straight or a little concave near the base; the basilar sulcation rather obsolete and sinuate, extending to the sides, the surface rugose-punctate. Elytra rather convex, costate throughout, the interstices deeply punctate-striate, furnished with single erect testaceous hairs; behind the middle a transversely shaped or rounded piceous spot is placed. Posterior femora short, not extending to the apices of the elytra, their tibiæ with a spine; the first joint of the posterior tarsi as long as the two following joints together.

Nagasaki or neighbourhood.

Although the shape of this species, of which Mr. Lewis obtained two specimens, differs from *L. hirtus* in being less elongate, that of the thorax and its groove as well as the state of the coxal cavities agrees with the genus; the costate and pubescent elytra, as well as the deflexed sides of the latter, are other characters which the species has in common with *Liprus*.

I may remark here that the species of *Liprus* lately described by myself in the 'Annals of the Genoa Museum' from Sumatra, although agreeing in most respects with the genus, differs from the other species of the present genus in the shape of the thorax, which is that of a species of *Lema*.

Genus Haltica, Geoff.

Haltica latericosta, sp. nov.

Metallic blue or green, subopaque; antennæ, tibiæ, and tarsi black; thorax and elytra scarcely visibly punctured, the latter with a very strongly developed costa from the shoulder to nearly the apex.

♀. Elytra without lateral costa.

Length 2–2½ lines.

Head impunctate, the frontal tubercles strongly raised; carina very short. Antennæ nearly as long as the body, the basal joints generally tinged with metallic blue, the rest black, second joint distinctly shorter than the third, this latter shorter than the following joint. Thorax not more than one half broader than long, rather convex, the basal groove deep and slightly sinuate, not extending upwards at the sides, the space in front and behind the groove extremely finely punctured, only visible under a strong lens. Elytra a little more distinctly punctured, the sutural margin slightly raised immediately below the base to a short extent; the lateral costa very strongly raised, commencing from the shoulder, but abbreviated at a little distance from the apex, the latter slightly hollowed out.

Sapporo, on sallow.

This species bears a great resemblance to *H. californica*, Mannerh., but is distinguished by the elytral costa not curving round to the suture, and the rather opaque or but little shining and very finely punctured elytra. The female does not differ in any way but by the absence of the costa. The latter in the male is more strongly developed than in any other species with which I am acquainted.

Haltica obscura, sp. nov.

Piceous; basal joints of the antennæ and the legs more or less fulvous; thorax distinctly, elytra more closely and strongly punctured.

Length 1¼ line.

Head impunctate, the frontal tubercles elongate, bounded behind by a transverse groove; carina very short and indistinct; labrum obscure flavous. Antennæ rather robust, thickened at the terminal joints, the third and fourth joints not longer, but thinner than the second, the five terminal joints fuscous, the others flavous. Thorax transversely subquadrate, the sides very nearly straight, the surface impressed near the base with a shallow transverse groove which extends to the sides, the disk distinctly but not very closely punctured. Elytra a little widened towards the apices, much more strongly and closely punctured than the thorax, the interstices here and there slightly wrinkled. Legs either entirely fulvous or stained with piceous.

Yuyama.

This species is a little larger than *H. picipes*, Baly, also from Japan, and may be at once separated by the distinctly punctured thorax and elytra, which in the other species are scarcely visibly punctate; the piceous or nearly black colour of the upper surface will help to distinguish the species from the many blue-coloured allied forms.

HALTICA LEWISI, sp. nov.

Entirely fulvous or testaceous; thorax transversely subquadrate, closely punctured; elytra closely subrugose-punctate.

Length $1\frac{1}{2}$ line.

Head impunctate, shining, the frontal tubercles distinctly raised out short. Antennæ half the length of the body, rather robust, entirely fulvous, the second joint thickened, scarcely shorter than the third, this and the following joints of nearly equal length. Thorax twice as broad as long, subquadrate, the sides straight, the anterior angles acute but not produced, the base with an obsolete transverse sinuate groove which has a deeper depression or fovea at the middle of the basal margin; surface not very closely but distinctly punctured, the punctures more deeply impressed within the basilar groove. Elytra closely and much more strongly punctured than the thorax, the interstices slightly rugose; first joint of the posterior tarsi as long as the two following together.

Kashiwagi, Chiuzenji.

The four specimens before me do not differ in any way; in all, the groove of the thorax is plainly visible, although not strongly defined in outline.

Genus LONGITARSUS, Latr.

LONGITARSUS NITIDA, sp. nov.

Fulvous, shining; head finely transversely rugose; thorax transverse, distinctly punctured; elytra not more strongly punctured, narrowed behind; antennæ as long as the body.

Length 2 lines.

Head with a few deep punctures and a fovea near the inner margin of the eyes; the frontal tubercles not raised, but limited behind by an oblique groove; carina broad, not strongly raised. Antennæ as long as the body, entirely fulvous, the apex of the terminal joint fuscous, the third about one half longer than the second joint. Thorax nearly three times as broad as long, the sides rather strongly deflexed, lateral margin a little rounded at the middle and slightly converging outwards, the anterior angles broadly oblique, forming a tooth at a little distance before the middle, surface rather convex, closely and finely punctured. Elytra widened towards the middle, strongly narrowed at the apex, the shoulders rounded; the disk not more strongly but a little more distantly punctured. Metatarsus of the posterior legs one half the length of the tibiæ.

Sapporo.

L. nitidus resembles in size our *L. verbasci*, but is of a narrower, posteriorly more pointed shape, and the punctuation of the thorax is more distinct, and that of the elytra more remotely placed; the third joint of the antennæ is also proportionately longer than in the European species.

LONGITARSUS HÆMORRHOIDALIS, sp. nov.

Ovate, convex, black; legs (the apices of the posterior femora excepted) pale fulvous; thorax very finely punctured; elytra black, the apices fulvous, distinctly semipunctate-striate.

Length 1 line.

Head impunctate; eyes large; the frontal tubercles entirely absent. Antennæ nearly as long as the body, black, the three or four basal joints fulvous, third and fourth joints equal in length, slightly longer than the second. Thorax transversely subquadrate, the sides nearly straight, not converging, the anterior angles obliquely thickened; surface very minutely and not very closely punctured, the interspaces extremely finely granulate when seen under a strong lens. Elytra narrowed at the apices, slightly widened at the middle in the female, their surface much more strongly punctured than that of the thorax, and arranged in close and rather regular rows, black, the apex more or less broadly fulvous. Metatarsus of the posterior tibiæ half their length, the apex of the posterior femora more or less piceous, the rest and the other legs fulvous.

Yokohama.

Smaller and less robust than the European *L. apicalis*, the antennæ shorter and not so thick, the thorax more finely punctured and less transverse, and the punctuation of the elytra more regularly arranged.

LONGITARSUS ORIENTALIS, sp. nov.

Ovate, narrow behind, pale testaceous; antennæ, their basal joints excepted, the sutural margin of the elytra, and the posterior femora piceous; thorax extremely finely, elytra more distinctly punctured.

Length $1\frac{1}{2}$–$1\frac{3}{4}$ line.

Head extremely finely transversely wrinkled when seen under a strong lens, with a rather deep impression near the inner margin of the eyes; the frontal tubercles indistinct; carina strongly raised. Antennæ nearly as long as the body, piceous or black, the three or four basal joints obscure testaceous, third joint longer than the second, but distinctly shorter than the fourth. Thorax transverse, rather more than twice as broad as long, the sides straight, not converging, the anterior angles oblique, surface very finely punctured when seen under a strong lens, rather convex. Elytra widened towards the middle, narrowed at the apex, closely and a little more distinctly punctured than the thorax, the interstices not wrinkled, the suture narrowly piceous through its entire length, but this colour slightly widened below the middle; posterior femora and the last joints of the tarsi piceous.

Kurigahara.

Nine specimens of this species were obtained: it is no doubt allied to several European forms and to one or two others described by Motschulsky, the descriptions given by this author being too superficial to identify with certainty his species. *L. orientalis* may be known by its comparative large size, the transversely wrinkled or finely rugose head, in connection with the black suture of the elytra, which in shape agrees with *L. atricilla*, Gyll., but this species is smaller and has a blackish head.

LONGITARSUS QUADRATICOLLIS, sp. nov.

Obscure dark fulvous; antennæ as long as the body; thorax subquadrate, impunctate; elytra finely semipunctate-striate.

Length ½ line.

Head impunctate, the frontal tubercles very narrow and transverse. Antennæ flavous, the second and third joints short and equal. Thorax very nearly square-shaped, the sides straight, the anterior angles scarcely oblique, surface entirely impunctate. Elytra nearly parallel, but little narrowed behind, finely and rather regularly punctured. Legs flavous, the posterior femora darker, the metatarsus rather longer than half the tibiæ.

Nara.

Amongst the small species of the present genus *L. quadraticollis* is somewhat closely allied to *L. pusillus*, but may be distinguished by the square-shaped and impunctate thorax. The elytra are larger at the base than the latter, and their shoulders are slightly prominent.

LONGITARSUS LYCOPI, Foudr.

The only difference I am able to find in the Japanese specimens from those of Europe is the slightly larger size of the former; all other characters agree so closely that I see no reason to consider the two specimens obtained at Japan (Tisac?) as specifically distinct.

LONGITARSUS PARVULA?, Allard.

A single specimen resembling this species extremely closely was obtained; the elytra are rather more strongly punctured than in the European form.

Genus APHTHONA, Chevr.

APHTHONA FOUDRASI, sp. nov.

Breast and abdomen piceous or black; head and thorax pale fulvous, nearly impunctate; elytra testaceous, very finely semiregularly punctate; legs testaceous, apices of the posterior femora piceous.

Length ¾ line.

Head impunctate, dark fulvous, the frontal tubercles in shape of narrow transverse ridges. Antennæ rather short, flavous or testaceous, the four or five terminal joints fuscous. Thorax transverse, of equal width, twice as broad as long, the sides nearly straight, surface scarcely or microscopically finely punctured. Scutellum piceous. Elytra slightly narrowed behind, finely but distinctly punctured, the punctuation arranged in close, rather regular lines which almost entirely disappear at the apex; the first joint of the posterior tarsi as long as the two following joints together.

Oyama.

This small species bears a great resemblance to several European forms, notably *A. flaviceps* and *A. lutescens*, from which several finely expressed, but constant differences seem to separate it. The head and thorax is always darker than in the named allied species, the punctuation of the thorax is scarcely visible, its sides straighter, the punctuation of the elytra is more distinct and absent near the apex; the reverse is the case in *A. flaviceps*, which is also of a much paler colour. Typical specimens of *A. flaviceps* and *A. lutescens* named by Allard are before me, but I cannot identify the present insect with either of them.

Aphthona semiviridis, sp. nov.

Below black, above dark metallic green; antennæ, the anterior legs and posterior tibiæ pale fulvous; thorax scarcely visibly, elytra more strongly punctured.

Length 1 line.

Head impunctate; the frontal tubercles quite obsolete. Antennæ nearly as long as the body, entirely fulvous or flavous, the second and third joints equal. Thorax about one half broader than long, subquadrate, the sides very slightly rounded near the apex, surface extremely finely punctured when seen under a strong lens. Elytra convex, nearly parallel in the male, more widened behind in the female, the shoulders distinct but not prominent; surface closely and much more distinctly punctured than the thorax; posterior femora piceous, the others and the legs fulvous or flavous.

Distinguished from other European species of similar colour of the elytra by the fulvous antennæ and fine punctuation of the thorax, from *A. atratula* by the much greater length of the former, and by the same character from *A. pygmæa*, Baly. The present insect seems also closely allied to *A. lacertosa*, Rosenh., but differs again in the entirely fulvous antennæ and the almost impunctate thorax.

Aphthona pryeri, Baly.

The five specimens obtained at Nikko and Kurigahara I must refer to the above species, although they differ in the entirely fulvous colour of the elytra, which in some specimens, however, have the suture narrowly black (in the type the elytra are entirely of that colour); there are no structural differences whatever to be found in the variety, and I have no doubt about their identity with Mr. Baly's species.

Aphthona pygmæa, Baly.

Mr. Baly described this species from a single specimen, which I have now before me. The description gives the colour of the insect as black, but I find the upper side of a decided greenish tint. The elytra are more distinctly punctured than the thorax, and the punctuation is arranged in very close semiregular lines. The specimens obtained this time by Mr. Lewis at Nikko, Kobe, and

Nagasaki I cannot well separate from *A. pygmæa*, although their shape is a little more slender and elongate, and the punctuation of the elytra rather more regularly arranged; other differences I cannot find. Numerous specimens were obtained this time, which are all of a metallic dark greenish colour like the type; the thorax has an obsolete depression at the sides more or less distinctly visible, and its punctuation seems also to be rather variable.

Genus PHYLLOTRETA, Foudr.

PHYLLOTRETA TENEBROSA, sp. nov.

Black; antennæ and legs flavous; posterior femora sometimes darker; thorax and elytra closely and distinctly punctured.

Length 1–1½ line.

Head with a few fine punctures at the vertex; the frontal tubercles distinctly raised, transversely oblique, bounded behind by a deep groove. Carina very short and broad; labrum more or less testaceous. Antennæ more than half the length of the body, entirely flavous, the third joint one half longer than the second, but shorter than the fourth. Thorax one half broader than long, the sides distinctly rounded as well as the posterior margin, the anterior one straight, the angles not produced; surface closely and distinctly punctured in some specimens, in others to a less extent. Elytra very moderately convex, punctured like the thorax, but the punctuation arranged in very close longitudinal rows; the pygidium slightly protruding beyond the apices of the elytra. Legs entirely flavous, the first joint of the posterior tarsi as long as the two following together.

Kobe, Kumamoto, Yuyama.

Smaller than *P. funesta*, Baly, and distinguished by the flavous legs and antennæ and the stronger punctuation. The posterior femora are but slightly thickened and much less than is usual in this genus, although sufficiently distinct for the recognition of the species as belonging to the present family. In some specimens the frontal tubercles are more or less flavous. The general colour of the upper surface of the insect is black and shining; the elytral epipleuræ are rather broad and continued below the middle.

Genus CHÆTOCNEMA, Steph.

CHÆTOCNEMA CHALCEOLA, sp. nov.

Ovate, obscure æneous, base of the antennæ and the tibiæ flavous; head finely granulate; thorax closely punctured; elytra strongly punctate-striate, the interstices impunctate, costate at the sides.

Length 1 line.

Head very finely granulate, impunctate or with a few punctures between the eyes; no frontal tubercles; carina broad and short. Antennæ about half the length of the body, the first four joints fulvous, terminal joints and the upper side of the first fuscous or black. Thorax more than twice as broad as long, the sides straight, surface closely and finely punctured, the interstices somowhat wrinkled. Elytra strongly and regularly punctate-striate, the interstices impunctate and slightly convex, costate at the sides and apex. Legs fulvous, the tibiæ with a darker more or less distinct mark, the posterior femora dark æneous.

Hosokute.

C. chalceola is evidently closely allied to *C. granulifrons*, Baly, of which I have the type for comparison, but in that species the thorax is more finely punctured as well as the elytra; the antennæ are nearly entirely fulvous as well as the tibiæ, and the shape of the insect is rather narrower and less robust. It may be, however, that the present insect is but a local form of Baly's species.

Chætocnema japonica, sp. nov.

Ovate, convex, æneous; antennæ and legs fulvous; head rugose-punctate; thorax closely and strongly punctured; elytra deeply punctate-striate, the interstices minutely punctured.

Length $1\frac{1}{4}$ line.

Head extremely finely granulate, strongly and very closely punctured throughout, the punctures sometimes confluent. Antennæ not extending further than the base of the elytra, fulvous, the apices of all the terminal joints stained with fuscous; the second, third, and fourth joints of nearly equal length. Thorax transverse, slightly widened at the middle, the sides slightly rounded; surface closely covered with round punctures, which are more strongly impressed at the sides than at the disk, the latter with a more or less distinct central, smooth, longitudinal space. Elytra a little widened towards the middle, very strongly and regularly punctate-striate; the interstices minutely punctured when seen under a strong lens, costate at the sides. Legs pale fulvous, the posterior femora stained with greenish æneous.

Hakodate, the sandhills, Fukushima, Nügata.

Closely allied to *C. ingenua*, Baly, from China, but more robust and of larger size, the head more strongly and closely punctured, and the elytral interstices minutely punctate; in *C. ingenua* the latter are impunctate.

Chætocnema fulvipes, sp. nov.

Dark æneous; antennæ, anterior legs, and posterior tibiæ fulvous; head and thorax closely punctured; elytra deeply punctate-striate, the interstices sparingly punctured.

Length $1\frac{1}{2}$ line.

Head closely rugose-punctate, the frontal tubercles and the carina entirely absent, lower part of face covered with some yellowish pubescence; palpi fulvous; antennæ of the same colour, scarcely half the length of the body, the second joint as thick as, but one half shorter than, the first, the following three as long as, but much thinner than, the second joint, the terminal five short and of equal length. Thorax nearly three times as broad as long, the sides very slightly rounded, surface finely but very closely punctured, the punctures at the sides nearly confluent. Elytra convex, narrowed at the apices, deeply and regularly punctured, the interstices slightly costate at the sides and sparingly impressed with fine punctures; posterior femora æneous, the tibiæ and the other legs fulvous.

Hakodate. A single specimen.

The comparatively large size of this insect, the rugosely punctured head without any raised tubercles, and the fulvous legs and antennæ separate it from its many congeners.

Chætocnema aurifrons, sp. nov.

Below blackish æneous; antennæ black, the basal joint fulvous; head cupreous, granulose-punctate; thorax and elytra violaceous blue, the former strongly punctured, the latter deeply punctate-striate.

Var. Head and thorax æneous, elytra light blue.

Length $1\frac{1}{2}$ line.

Head obscure cupreous, finely granulose and very closely punctured; no frontal tubercles. Antennæ half the length of the body, the two lower joints fulvous, the rest black, third and fourth joints equal. Thorax twice as broad as long, widened at the middle, the sides straight, surface as closely but more strongly punctured than the head, the punctures semiconfluent at the sides. Elytra widened towards the middle, narrowed at the apices, very strongly and regularly punctate-striate, the interstices slightly convex at the sides; femora greenish æneous; tibiæ fulvous, the anterior ones stained with greenish æneous.

Oguma. Three specimens.

The colour of the head and that of the thorax and elytra separates this species from any of its congeners. In the variety, which is of smaller size, the entire thorax is of the same metallic æneous colour as the head, and the elytra are bright blue, but structural differences I am not able to see.

Genus Hyphasis, Harold.

Hyphasis inconstans, sp. nov. (Plate XLVI. fig. 1.)

Fulvous or piceous; the seven last joints of the antennæ black; thorax finely and remotely, elytra more distinctly and very closely punctured.

Length $\frac{3}{4}$–1 line.

Head with fine longitudinal striæ at the vertex when seen under a strong lens, obsoletely depressed between the eyes; frontal tubercles strongly raised, rather elongate; penultimate joint of the palpi thickened, the terminal one acute. Antennæ about half the length of the body, the four or five lower joints fulvous, the rest black, second joint much thicker than the third, but not longer. Thorax transverse, widened at the middle, the sides straight, oblique at the anterior angles, the disk covered with fine but not closely arranged punctures. Elytra with a narrow lateral margin, very closely punctured, the space near the suture slightly wrinkled, piceous or fulvous; the thorax of a more reddish fulvous. Metatarsus of the posterior tibiæ as long as the two following joints together, claw-joint distinctly swollen.

Yuyama, Hitoyoshi.

There are three specimens of an entirely fulvous colour, and three in which the thorax only is of this shade. The species is closely allied to *H. beavani*, Baly, from India; but in the latter the elytra are of a metallic blue or green colour, and the head shows no traces of strigæ.

Genus Argopus, Fisher.

Argopus nigripennis, sp. nov.

Black; lower part of head fulvous; thorax narrowed in front, closely punctured; elytra irregularly and closely punctate.

Length 2 lines.

Head impunctate at the vertex; frontal tubercles divided and bounded behind by a moderately deep transverse groove; lower part of face rugosely punctured, fulvous. Antennæ more than half the length of the body, black, the apices of the first three joints fulvous, second and third joints equal, one half shorter than the fourth. Thorax narrowed in front, the sides but little rounded, surface rather closely and irregularly punctured, the basal margin impressed at each side with a row of deeper punctures. Scutellum fulvous. Elytra not more strongly punctured than the thorax, the punctuation irregular and only here and there arranged in striæ, the punctuation absent at the anterior portion near the lateral margin, the latter impressed with a deep row of punctures. Underside and legs black, the anterior coxæ and the apex of the abdomen fulvous.

Shimonosuwa.

I am somewhat doubtful whether the single specimen before me represents really a new or a variety of one or other species of *Argopus*, perhaps *A. nigritarsis*. The thorax of that species is, however, more transverse and less narrowed in front, and the general shape of the insect more rounded; the black colour of the present species is unique amongst its allies.

Argopus clarki, sp. nov.

Ovate, convex, pale fulvous; antennæ (the three basal joints excepted) and legs black; thorax very finely punctured; elytra strongly subgeminate punctate-striate.

Length 2 lines.

Head impunctate, the frontal tubercles flattened and broad. Antennæ half the length of the body, black; the three basal joints fulvous, second and third joints short and equal. Thorax at least three times as broad as long, the sides rather rounded, the anterior angles oblique; surface rather closely covered with fine and larger punctures, a row of the latter accompanying the posterior margin. Elytra strongly punctate-striate, the punctures arranged in irregular and rather remotely placed double lines, the space near the lateral margins impunctate. Underside fulvous. Legs black.

Miyanoshita.

I must separate this species, of which only a single specimen is before me, from all others described, on account of the strong and distantly placed double lines of punctures at the elytra, in connection with the black legs and antennæ.

Genus Sphæroderma, Stephens.

Sphæroderma fuscicornis, Baly.

Var. *a*. Antennæ entirely fulvous.

Var. *b*. Elytra black, antennæ either fulvous or the terminal joints fuscous; underside and the posterior or all femora black.

In comparing the var. *b* with Mr. Baly's type, I can come to no other conclusion than to consider the species a very variable one as regards colour and also size. Many specimens of the normal colouring were obtained by Mr. Lewis during his first journey to Japan, and are again contained in the present collection taken in company with those in which the elytra are black. In other respects I can find no differences, and although the possibility is not excluded that the two forms are not identical, I prefer at present to consider them as such. In all, the thorax and the elytra are finely and closely punctured, that of the elytra very irregularly arranged in rows. There is a single specimen before me in which the elytra have a distinct fulvous tint as well as a darker one, thus proving that either one or the other colour may predominate.

Obtained at Kashiwagi, Tsumago, Fukushima.

Sphæroderma balyi, sp. nov.

Piceous or black below; head, basal joints of the antennæ, thorax, and legs, the posterior femora excepted, fulvous; elytra black, finely geminate punctate-striate.

Var. Antennæ entirely fulvous.

Length 1 line.

It will only be necessary to point out the differences between this species and those closely allied and described by Mr. Baly, of which *S. apicalis* seems to be the nearest allied. In this species, however, the posterior margin of the thorax is always partly black, and the apices of the elytra fulvous, but the more important difference is to be found in the less transverse and more strongly punctured thorax of *S. balyi*, and in the different punctuation of the elytra, in which the punctured rows are wider apart and arranged near the suture in irregular double lines; near the sides the rows of punctures are single and much more distantly placed than in *S. apicalis*. There are two specimens before me, in one of which the antennæ, which do not differ from those in the allied species, are fulvous, this colour being restricted in the other specimen to the four first joints.

Sphæroderma atra, sp. nov.

Black; four basal joints of the antennæ and the tibiæ fulvous; thorax finely and closely punctured; elytra more strongly semi-regularly punctate-striate.

Length 1–1¼ line.

Vertex impunctate, the frontal tubercles narrowly and transversely shaped. Labrum and palpi fulvous. Antennæ two thirds the length of the body, the third and fourth joints equal and smaller and thinner than the second, the four or sometimes the five basal joints and the apex of the terminal one fulvous, the others black. Thorax twice as broad as long, the posterior margin distinctly sinuate at each side near the middle; surface closely and finely punctured, leaving a narrow middle line smooth; anterior angles narrowly fulvous. Elytra strongly convex, narrowed near the apices, the shoulders not prominent, the punctuation more distinct than that of the thorax, and arranged in close and rather irregular rows, a broader space in front of the lateral margin impunctate. Posterior femora black, the others and the tibiæ and tarsi fulvous, the third joint of the latter much broader than the second.

Oyama, Kiga, Nikko.

Separated from *S. japana*, Baly, and *S. separata* by the entirely black, not blue, colour of the upper side, by the fulvous angles of the thorax, and the more closely and finely punctured elytra, as well as by the colour of the labrum and palpi.

SPHÆRODERMA ABDOMINALIS, sp. nov.

Ovate; black, apices of the elytra and the abdomen flavous; thorax very finely punctured; elytra regularly and distinctly punctate-striate.

Var. The sides of the elytra fulvous.

Length $1\frac{1}{2}$–$1\frac{3}{4}$ line.

Head entirely impunctate, the frontal tubercles very obsolete. Antennæ stout, more than half the length of the body, the first three joints fulvous, the basal ones stained with black above, the rest entirely of that colour, the second and third joints equal in length. Thorax transverse, the sides rounded and narrowly margined, the anterior angles thickened and oblique, the posterior margin strongly sinuate near the scutellum; surface covered with very small and some larger punctures, the latter not very closely and irregularly placed. Elytra wider at the base than the thorax, the shoulders prominent and impunctate, the disk rather strongly punctate-striate, the striæ near the suture more closely placed and more irregular than the others; the apices of the elytra flavous, this colour narrowed and extending upwards a little at the lateral margin. Legs black. Abdomen flavous.

Yuyama, Kashiwagi.

SPHÆRODERMA UNICOLOR, sp. nov.

Entirely fulvous; head impunctate; thorax scarcely visibly, elytra distinctly and remotely punctured.

Length $1\frac{1}{2}$ line.

Head impunctate, the frontal tubercles transverse, the carina flattened and short. Antennæ more than half the length of the body, fulvous, the second and third joints short and of equal length, the following gradually thickened. Thorax transverse, widened at the middle, the sides very slightly rounded, posterior margin sinuate at each side, its median lobe broadly rounded, surface extremely finely punctured, only visible under a very strong lens; a row of punctures is also placed along the posterior margin. Elytra convex, rather strongly punctured, the punctuation arranged in rather distant rows, which at the disk approach in pairs; between the last row and the lateral margin is a broad impunctate space; prosternum narrowly elongate; posterior thighs with an obsolete longitudinal sulcation.

Nikko. A single specimen.

Closely allied to *S. fuscicornis*, Baly, but separated by the entirely fulvous antennæ, the much more finely punctured thorax, and the much stronger and more distant punctuation of the elytra.

Sphæroderma nigricollis, sp. nov.

Oblong-ovate; fulvous, apical joints of the antennæ and the tibiæ piceous; thorax black, margined with fulvous, finely punctured; elytra regularly punctate-striate.

Length $1\frac{1}{2}$ line.

Head impunctate, obscure dark fulvous; the frontal tubercles obsolete but limited laterally by a distinct groove; labrum piceous, margined with testaceous, the maxillary palpi entirely of the latter colour. Antennæ half the length of the body, the first four joints fulvous, the rest black, third and fourth joints short and equal, the second rather longer and thickened. Thorax widened at the middle, the lateral margin slightly rounded, the sides narrowly margined, the anterior angles oblique, the posterior margin distinctly sinuate at each side near the scutellum; surface extremely finely but not very closely punctured, black, the sides and the anterior margin narrowly fulvous. Elytra slightly wider than the thorax, the shoulders somewhat thickened and prominent, finely, regularly, and rather remotely punctate-striate, fulvous, the punctures surrounded by a small piceous ring. The posterior femora and the apices of all the tibiæ piceous, the rest and the underside fulvous, the sides of the breast also more or less piceous.

Yuyama, Konosé (2 specimens).

The colour of the thorax, in connection with the regularly punctate-striate elytra, separates this species principally from its allies.

Sphæroderma japana, Baly, var.

In comparing the three specimens obtained by Mr. Lewis at Jensai with the type of *S. japana*, I have no doubt as to their identity with this species, although the colour is different, proving the species, which was described from a single specimen, to be variable in this respect. The specimens before me from Jensai are fulvous, with the exception of the elytra, which are piceous, the sutural and lateral margin remaining only narrowly fulvous; the legs and antennæ are entirely of this colour. In shape, sculpture, and every other character there is no difference to be found.

Genus Argopistes, Motsch.

Argopistes unicolor, sp. nov.

Rotundate, convex, entirely black above; basal joints of the antennæ, the knees and the tarsi fulvous; thorax closely punctured; elytra punctate-striate, the interstices finely punctured.

Length 1 line.

Head with a few punctures near the inner margin of the eyes. Antennæ half the length of the body, the third joint very small, the first three fulvous below, the others black, apex of the terminal joint also fulvous. Thorax transverse, widened at the middle, the basal margin sinuate at each side, the sides straight, surface very finely and closely punctured. Elytra wider than the thorax, slightly narrowed towards the apices, the latter rounded; surface punctate-striate, the striæ rather distantly placed, and the punctures larger and more distinct than those between the rows, which are closely placed; tarsi flavous.

Yuyama.

This species cannot be considered a variety of *A. biplagiatus*, Motsch., on account of the quite different elytral punctuation, which is arranged in distant rows with the interstices more finely punctured. Motschulsky has described or mentioned a species (*A. flavitarsis*) which seems very closely allied to the present insect in colour; but as Motschulsky describes the antennæ as testaceous and the legs as brownish, and says nothing at all about the punctuation of the upper surface, it is impossible to come to a definite conclusion as to the possible identity of this species and *A. unicolor*.

The author of the genus *Argopistes* has made no mention as to the state of the coxal cavities nor the shape of the prosternum and other parts so essential in the classification of the Halticidæ. In *A. biplagiatus* the prosternum is of an elongate and at the same time rather broad shape, longitudinally channelled and leaving the coxal cavities open. The mesosternum, as in *Argopus*, is extremely short and scarcely visible; the first abdominal segment is furnished with a longitudinal ridge at each side. The posterior femora are very strongly developed, almost subhemispherical, their tibiæ short, robust, and distinctly widened near the apex, the latter produced in an acute point and furnished at the sides with a distinct spine; the first joint of the posterior tarsi is as long as or longer than half the tibiæ.

Argopistes undecimmaculata, sp. nov.

Piceous below; antennæ, tibiæ, and tarsi testaceous; above fulvous, closely punctured; elytra with four spots before, five behind the middle, and two small spots at the apices, placed transversely, black.

Length $1\frac{1}{2}$ line.

Head with a few punctures and a deep transverse groove between the eyes; clypeus in shape of a triangular strongly raised ridge. Antennæ half the length of the body, third and fourth joints equal, the rest gradually increasing in size, fulvous. Thorax narrow, transverse, the posterior margin strongly rounded, the sides straight, slightly thickened in front of the margin, the surface very closely and finely punctured. Elytra rounded, punctured like the thorax, the inner margin of their epipleuræ placed far inwards; each elytron with a small black spot at the shoulder, another near the scutellum, three others, of which the third is sutural and common to both elytron, placed behind the anterior ones near the middle, and a small spot at the apex; the apices of the femora, tibiæ, and tarsi fulvous, the rest of the underside piceous. Prosternum elongate, rather broad; coxal cavities open.

Sapporo.

In one of the specimens the elytral spots are very obscure and of a dark fulvous colour, but their position is the same as in the other.

Genus Psylliodes, Latr.

Psylliodes subrugosa, sp. nov.

Piceous below; antennæ and tibiæ fulvous; above dark blue; head and thorax closely punctured; elytra strongly punctate-striate, the interstices finely punctured and slightly rugose.

Length 1 line.

Head distinctly punctured (when seen under a strong lens). Antennæ entirely fulvous, the second and third joints of equal length. Thorax rather convex, about twice as broad as long, the surface closely and more strongly punctured than the head, with an indistinct central raised line. Elytra rather broad and convex, and strongly punctate-striate, the interstices finely punctured, and slightly rugose at the sides. Legs piceous; the knees, tarsi, and the posterior tibiæ fulvous.

Hakodate. A single specimen.

From the other three known Japanese species the present one is separated by its shorter, broader, and more convex shape, especially in regard to the thorax, the punctuation of which is much stronger than in the allied species; further, by the entirely fulvous antennæ in connection with the slightly wrinkled interstices of the elytra, which is principally to be seen at the sides when the insect is held in a certain light. In *P. angusticollis*, Baly, the elytral punctuation is much finer.

Psylliodes intermedia, sp. nov.

Piceous; above dark blue; antennæ black, the two basal joints testaceous; thorax extremely finely punctured; elytra very deeply punctate-striate, the interstices costate at the sides, finely punctured and wrinkled.

Length 1 line.

Otsu. A single specimen.

The head in this species is impunctate; the antennæ, with the exception of the two first joints, entirely black; the thorax is scarcely visibly punctured and granulate. The elytra are very deeply punctate-striate, and the striæ are more closely placed than in the other Japanese species; the interstices are convex at the sides, and obsoletely transversely wrinkled; the legs are entirely piceous. *P. difficilis*, Baly, which has also convex elytral interstices, is much larger, and of a bright metallic blue, the thorax is distinctly punctured, and the elytral striæ are more finely impressed and more distantly placed.

Psylliodes japonica, sp. nov.

Oblong, black below; antennæ, the anterior legs, and the posterior tibiæ flavous; above dark metallic green; vertex impunctate; thorax closely punctured; elytra strongly punctate-striate, the interstices finely punctured.

Length 1 line.

Head extremely finely granulate, impunctate, with a narrow but deep oblique groove at each side above the antennæ, the space between the latter broad and slightly raised. Antennæ entirely flavous, the second joint slightly longer than the third. Thorax twice as broad as long, the sides nearly straight, surface extremely finely granulate, closely and finely punctured. Elytra narrowed at the apices, strongly and regularly punctate-striate, the interstices with a single row of fine punctures, somewhat raised near the apex.

Sapporo.

Rather smaller than *P. angusticollis*, Baly; the head and thorax differently punctured and granulate, and the elytra more strongly punctate-striate, with the interstices not impunctate as in that species, but with a single row of punctures; another different structural character is the oblique groove at each side above the antennæ.

Genus Enneamera, Har.

Enneamera tibialis, sp. nov.

Black; antennæ fuscous; elytra dark greenish blue, closely punctured; four anterior legs, base of the posterior femora, abdomen, and the tibiæ and tarsi fulvous or testaceous.

Length $1\frac{1}{2}$–$1\frac{3}{4}$ line.

Head with a few very fine punctures, the frontal tubercles limited behind by a deep transverse groove. Labrum piceous. Antennæ obscure fuscous or fulvous, the third joint distinctly longer than the second. Thorax more than twice as broad as long, black, extremely finely punctured, the anterior angles obscure fulvous. Scutellum black. Elytra convex, scarcely widened below the middle, their surface very finely and closely punctured.

Jensai, Fukushima, Nikko, Nara.

Easily distinguished from *E. cyanea*, Baly, and *E. fulviventris*, Baly, by the black, not blue, thorax, and the colour of the anterior legs and all the tibiæ, as well as by the obscure fulvous antennæ. Nine specimens were obtained.

Genus Manobia, Jacoby.

Manobia lewisi, sp. nov.

Subquadrate-ovate, piceous; above fulvous; thorax finely and remotely punctured; elytra regularly and strongly punctate-striate, the base swollen.

Length $\frac{3}{4}$ line.

Head impunctate, obliquely grooved above the insertion of the antennæ; the latter more than half the length of the body, fulvous; the second joint as thick as the first, but one half shorter, the two following of the same length, but much thinner, the four or five terminal joints thickened. Thorax scarcely twice as broad as long, the sides straight and converging from the base to the apex, the anterior angles slightly oblique and not produced; surface impressed with fine and remotely-placed punctures, transversely grooved near the base, the groove slightly sinuate and extending to the sides. Elytra subquadrate, the base distinctly raised, the punctured striæ very distinct and extending to the apex, the interstices near the lateral margin slightly costate. Legs entirely fulvous, the first joint of the posterior tarsi as long as the two following together; claws appendiculate; anterior coxal cavities open.

Jchiuchi.

This genus was established by myself on some small-sized *Halticinæ* from the Malayan Archipelago, and described in the 'Annals of the Genoa Museum.' The present species is smaller than any of its allies, and differs in the general coloration as well as in the punctuation of the elytra, which is more distant in regard to the striæ.

Genus Aphthonoides, Jacoby.

Aphthonoides beccarii, Jac. (Plate XLVI. fig. 2.)

The species upon which I was obliged to establish this genus has been recently described by myself in the 'Annals of the Genoa Museum;' the specimens which served for the description were obtained at Java by Signor O. Beccari. The differences between these and the specimens collected by Mr. Lewis at Jchiuchi and Nagasaki are so slight that I prefer to look upon them as variation rather than specific. These differences consist in the lighter-coloured antennæ and legs in the Japanese insects, and in the rather more transversely shaped thorax; other marks of distinction I am not able to see, and it is very probable that I am right in considering the two forms as specifically identical, the more so as there are several instances of similar identity of species in other families amongst the Coleoptera of Japan and the Malayan islands.

The present genus, which has quite the appearance of a small species of *Aphthona*, is at once distinguished by the long and acute spine attached to the posterior femora, which is longer than the corresponding tibia, by the regularly punctate-striate elytra, and the broader prosternum.

Genus Phyllobrotica, Redt.

Phyllobrotica nigrita, sp. nov. (Plate XLVI. fig. 3.)

Black; abdomen testaceous; thorax impunctate; elytra with two longitudinal costæ, very finely punctured, shining.

Length 2 lines.

Head impunctate, deeply grooved between the antennæ, the frontal tubercles strongly raised as well as the carina, the latter joined to the clypeus. Palpi robust, the penultimate joint strongly incrassate. Antennæ half the length of the body, the third joint longer than the second, but shorter than the fourth. Thorax subquadrate, broader than long, the sides straight at the base, and narrowed, converging to the apex; surface with two deep depressions, black, shining, impunctate. Elytra broader than the thorax, the shoulders prominent and bounded within by a rather deep longitudinal depression, the base distinctly raised, the disk very minutely punctured; a narrow longitudinal ridge, abbreviated near the apex, is situated at the middle of the disk; another extends from the shoulder nearly to the apex. Underside and legs black, the latter slender; tibiæ unarmed, the first joint of the posterior tarsi as long as the two following joints united; claws appendiculate. Abdomen testaceous; anterior coxal cavities open; elytral epipleuræ extremely narrow.

Osaka.

Genus Luperus, Geoffr.

Luperus hirsutus, sp. nov. (Plate XLVI. fig. 4.)

Entirely black, covered with very fine yellowish pubescence; antennæ longer than the body in the male; thorax finely rugose; elytra minutely punctured.

Length 2 lines.

Head very finely rugose-punctate, the frontal tubercles rather distinctly raised. Antennæ about one half longer than the body in the male, shorter in the female, black; the underside of the first three joints sometimes testaceous, fourth joint slightly longer than the third. Thorax subquadrate, one half broader than long, the anterior angles slightly thickened and produced in a short shining black tooth; the surface rather depressed, finely rugose-punctate and covered with very short pubescence. Elytra a little widened towards the apices, pubescent like the thorax, the punctuation extremely close and fine. The metatarsus of the posterior legs longer than the following joints together.

Nikko, Yuyama, Kiga, Hitoyoshi.

The short silky pubescence of this species, which covers the entire upper surface, but allows the punctuation to be well seen, will distinguish the insect at first sight.

Luperus longicornis, sp. nov. (Plate XLVI. fig. 5.)

Black; antennæ much longer than the body, above dark metallic blue; thorax finely and remotely, elytra closely and strongly punctured.

Length $1\frac{3}{4}$–2 lines.

♂. Head impunctate, deeply grooved between the antennæ. Eyes large and prominent. Antennæ black or fuscous, twice as long as the body, the second joint short, the third more than three times as long, the rest more elongate and slender. Thorax subquadrate, one half broader than long, all the angles produced in a tooth, the sides straight; surface somewhat depressed at the disk, remotely punctured at the sides and near the basal margin, the middle of the disk almost impunctate. Scutellum smooth, impunctate, black. Elytra parallel, rather convex, much more strongly punctured than the thorax, and the punctuation arranged in very close irregular rows, the interstices slightly wrinkled at the sides. Legs blackish, the apices of the tibiæ and the tarsi sometimes obscure testaceous.

♀. Eyes much smaller and less prominent, the third joint of the antennæ only one half longer than the second.

Nikko, Kobe, Yuyama.

Genus Luperodes, Motsch.

Luperodes nigripennis, Motsch.

Two specimens from Obaru I must refer to this species, with the description of which they agree very nearly. In one of the Japanese specimens the first joint of the antennæ is fulvous, and the sides of the head are marked with black; all the rest agrees with Motschulsky's description. In the other, which is of much smaller size, the head and the abdomen are entirely black, and the apices of the femora are more or less testaceous.

In the absence of more specimens for comparison, I cannot say whether the Japanese insects may represent another species or varieties of Motschulsky's type.

Genus Galerucella, Crotch.

Galerucella nigromarginata, sp. nov. (Plate XLVI. fig. 10.)

Narrowly elongate, parallel; black; lower part of the face and the thorax testaceous, the latter with three spots; elytra rugosely punctured, finely pubescent, testaceous, the sutural and lateral margin narrowly black; legs testaceous.

Length 2 lines.

Head rugose-punctate, black; the frontal tubercles and the lower part testaceous. Labrum black. Antennæ half the length of the body, black, the two basal joints testaceous below, the third joint very slightly longer than the fourth. Thorax twice as broad as long, the sides distinctly angulate at the middle, the posterior angles acute and strongly obliquely shaped; surface with an obsolete depression at the sides, rather strongly rugose-punctate, testaceous; a round black spot is placed at each side and a more square-shaped one at the middle. Scutellum black, finely punctured. Elytra testaceous, the disk slightly darker, the sutural and lateral margins narrowly edged with black; the surface very closely punctured, the interstices transversely wrinkled and sparingly covered with short yellowish hairs. Legs testaceous, the tarsi somewhat darker.

Principally distinguished by the three-spotted thorax, in connection with the narrow black sutural and lateral margins of the elytra, which colour separates the species from *G. nymphææ*, L., to which it seems closely allied; but in the latter the margins of the elytra are paler than the disk, and show no trace of darker colour.

Galerucella seminigra, sp. nov.

Elongate, parallel, subcylindrical; black; elytra fulvous, pubescent; head and thorax very finely punctured, the posterior margin of the latter obscure fulvous; elytra extremely finely and closely punctured.

Length 3½ lines.

Head broadly depressed at the middle, finely and closely rugose-punctate, labrum margined with testaceous. Antennæ half the length of the body, the second and third joints of equal length, and shorter than the other joints, their apices more or less testaceous. Thorax more than three times as broad as long, the sides slightly rounded at the middle, nearly straight at the base, the posterior angles oblique; the surface with three deep longitudinal depressions, the central one of a more triangular shape; middle of the disk very finely, the sides more strongly punctured, rather shining; black, the posterior margins obscurely edged with fulvous. Scutellum broad, its apex broadly rounded, black, pubescent. Elytra reddish fulvous, extremely closely and finely punctured, and covered with yellowish hairs. Underside and legs black; the first joint of the posterior tarsi slightly longer than the second.

Yagohara. A single specimen.

Principally distinguished by the black head and thorax, and the fulvous elytra, in connection with its rather larger size.

Galerucella viridipennis, sp. nov. (Plate XLVI. fig. 9.)

Elongate, parallel; black; head and thorax finely rugose-punctate; elytra metallic green, finely rugose and pubescent.

Length 2 lines.

Head rugosely punctured, the frontal tubercles divided by a deep groove. Antennæ black, nearly as long as the body, the third joint double as long as the second, but much shorter than the fourth, the following joints gradually decreasing in length. Thorax twice as broad as long, the sides slightly rounded, the anterior and posterior margin straight; the disk with a transverse deep depression at each side, which is but slightly interrupted at the middle, rather finely and irregularly punctured and sparingly covered with yellowish hairs. Scutellum black. Elytra bright metallic green, very finely and closely rugose, sparingly pubescent. Tibiæ unarmed. Claws bifid. Anterior coxal cavities closed.

Kurigahara, Wada toge.

Of this handsome species a good many specimens were obtained; the bright green elytra, and black head and thorax will at once assist in its recognition.

GALERUCELLA SEMIFULVA, sp. nov. (Plate XLVI. fig. 11.)

Ovate-oblong, convex; head, antennæ, breast, and legs black; thorax fulvous, the disk black; elytra closely punctured and finely pubescent, rufous or fulvous; abdomen testaceous.

Length $2\frac{1}{4}$ lines.

Head closely rugose-punctate, black, the lower part of the face testaceous; the frontal tubercles but slightly raised, but separated by a narrow groove. Antennæ rather more than half the length of the body, black, the underside of the lower joints more or less testaceous, the third joint distinctly longer than the second or the fourth. Thorax narrowly transverse, three times as broad as long, the sides distinctly rounded at the middle, the angles tuberculiform, the anterior ones furnished with a single seta; the surface rather deeply depressed at the sides, closely rugose-punctate, the middle of the disk with a more or less broad longitudinal black band. Scutellum broad, black, rugose-punctate, and covered with yellow pubescence. Elytra convex, more finely punctured than the thorax, rufous or fulvous, covered with fine yellow hairs. The first joint of the posterior tarsi a little longer than the second; claws bifid.

Kiga.

GALERUCELLA VITTATICOLLIS, Baly.

The description of Mr. Baly of this species, the type of which I have before me, requires some additional remarks:—The antennæ have the first three or four joints *testaceous* below (not piceous as the description says); the thorax is rugose, punctate at the sides only, where they are deeply depressed; the middle portion of the disk consists of a longitudinal raised, smooth and shining space, which is sometimes of a darker tint than the rest of the surface (in no specimen do I find a black broad band as given by the author). The elytra show occasionally an obscure fuscous lateral narrow band from the shoulder to below the middle, which is, however, generally absent; their punctuation is often more coarse than that of the thorax, but varies in depth.

Yokohama.

GALERUCELLA MODESTA, sp. nov.

Ovate, convex; pale fulvous; base of the head, antennæ, tibiæ, and tarsi black; above darker fulvous, finely pubescent, closely punctured; thorax with a central blackish band; breast piceous.

Length $1\frac{3}{4}$ line.

Head rugose-punctate, black, pubescent, lower part of face fulvous; labrum and palpi piceous. Antennæ black, the three basal joints testaceous below, the third and fourth joints equal. Thorax transverse, the sides strongly rounded and produced at the middle, the angles acute but scarcely produced; surface with a longitudinal central groove and a deeper depression at each side, closely rugose-punctate, fulvous, the central depression piceous. Scutellum black, punctured and pubescent. Elytra rather convex, and nearly parallel, punctured like the thorax, and thinly covered with yellow hairs.

Femora and abdomen fulvous. Tibiæ, tarsi, and the breast piceous or black.

Nikko.

This species has the same shape as *G. semifulva,* but is smaller, of paler colour; the antennæ are shorter and have the third and fourth joints equal (in the other species the third joint is distinctly longer); the punctuation of the elytra also is much stronger, and the legs are of different colour.

GALERUCELLA FUSCIPENNIS, sp. nov.

Elongate, convex; black; lower part of face, thorax, the base of the femora, and abdomen testaceous; thorax with three fuscous spots; elytra fuscous, finely pubescent and punctured, the lateral margin obscure testaceous.

Length 4 lines.

Head finely rugose-punctate, black, with a fine central groove, the lower part of the face testaceous. Antennæ half the length of the body, the second and third joints equal, the fourth distinctly longer, closely pubescent. Thorax narrowly transverse, about three times as broad as long, the sides but moderately rounded, the angles obtuse; surface rather deeply depressed along the anterior margin, and with three rather deeper foveæ at the base, the middle one of which is of triangular shape; the interior of these foveæ is stained with black. Scutellum black, covered with long pubescence. Elytra obscure fuscous, slightly tinged with green, their extreme base and the lateral margin narrowly testaceous; surface extremely closely and finely punctured, thinly but closely covered with yellowish pubescence. Femora fulvous at their base; the knees, tibiæ, tarsi, and the sides of the breast black. Abdomen fulvous.

Awomori. A single specimen.

This species approaches in size *G. annulicornis,* Baly, but the structure of the antennæ in the latter is quite different, the thorax is also of other shape, and the elytra have a broad flattened margin which is wanting in the present species.

Genus GALERUCA, Geoffr.

GALERUCA (ADIMONIA) MULTICOSTATA, sp. nov. (Plate XLVI. fig. 7.)

Oblong, narrowly parallel; black, above rufous; thorax strongly punctured with some deep foveæ; elytra deeply punctate-striate, the interstices costate throughout.

Length 2–3 lines.

Head with a few fine and remotely placed punctures; the frontal tubercles black, very strongly raised and limited behind by a deep groove; palpi black. Antennæ rather more than two thirds the length of the body, black; the second joint short, third and fourth of equal length. Thorax about one half broader than long, subquadrate, the sides very little rounded, the angles not produced; the disk with three deep longitudinal foveæ and another transverse sulcation at the base (these foveæ are sometimes interrupted in such a way as to form three impressions parallel with the anterior and three parallel with the posterior margin); the interstices swollen or irregularly raised, covered, as well as the interior of the impressions, with deep punctures. Scutellum piceous or fulvous, its apex broadly rounded. Elytra not widened behind, rufous or sanguineous, like the head and thorax; each elytron with eight strongly raised and closely approached costæ, the space between the first costa and the suture of double the width between the others, the interstices very deeply and regularly impressed with round punctures. Underside and legs black, finely covered with sparing yellow pubescence; the femora and knees sometimes obscure fulvous; anterior coxal cavities closed; claws appendiculate.

Kiga, Konose, Jchiuchi, Suyama on lillies.

From any of the similarly coloured European species, *A. multicostata* is at once to be separated by the eight closely approached costæ, which leave a broader space only between the first and the sutural margin.

Genus Galerucida, Motsch.

Galerucida lewisi, sp. nov. (Plate XLVI. fig. 6.)

Black; thorax foveolate-punctate; elytra closely and very deeply semipunctate-striate; a spot at the shoulder, a transverse narrow sinuate band behind the middle, and a round spot near the apex yellow.

Length 3 lines.

Head impunctate; antennæ more than two thirds the length of the body, the second and third joints very short and equal. Thorax transverse, sides nearly straight, slightly widened in front, the anterior angles produced in shape of a small tubercle, surface irregularly covered with deep foveolate punctures. Scutellum impunctate. Elytra very deeply and rather closely punctured, the punctures arranged in semiregular rows and sometimes confluent; the small yellow spot placed at the shoulder smooth and raised, the transverse band below the middle sinuate and not extending to the suture, the apical spot round and small.

Oyama.

This species, of which many specimens were obtained by Mr. Lewis, cannot be mistaken for a variety of *G. bifasciata* or *G. consociata*, Baly, on account of the quite different punctuation of the elytra, the interstices of which are impunctate and smooth, the punctures themselves being arranged in single rows.

Genus Sphenoraia, Clark.

Sphenoraia intermedia, sp. nov.

Black; thorax strongly and remotely punctured; elytra metallic blue, strongly subgeminate punctate-striate, the interstices finely punctured.

Length 2 lines.

Noheyi. A single specimen.

The only two species with which the present one can be compared are *S. fulgida* and *S. magica*, Harold. Both are, however, of double the size and differ in the coloration of the head and thorax, which is black in *S. intermedia*. The antennæ in the latter are *not* thickened as in *S. fulgida*, in which character it seems to agree with the species described by Von Harold; this author gives, however, the punctuation of the elytra as more strong than in *S. fulgida*, while in the present species it is of about the same strength, but the striæ are more distantly placed, geminate anteriorly only, and the interstices are finely punctured. In the absence of other specimens all doubt as to the specific value of *S. intermedia* is not excluded.

SPHENORAIA MELANOCEPHALA, sp. nov.

Black; thorax and elytra fulvous, the former strongly punctured, the latter subgeminate punctate-striate, the interstices closely and more finely punctured.

Length 3 lines.

Head black or piceous, with a deep triangular groove between the eyes, the vertex with a few fine punctures. Antennæ black, two thirds the length of the body, second and third joints short, the following somewhat flattened and widened, the three lower joints shining, the rest opaque, pubescent. Thorax more than twice as broad as long, the sides rounded, the anterior angles obliquely shaped, the posterior margin oblique at the sides, straight at the middle; the disk with a deep transverse depression at each side, the latter strongly and irregularly punctured. Elytra convex, parallel, fulvous like the thorax, the space near the suture deeply punctate-striate, the punctures slightly approached in double rows, the sides as deeply but irregularly punctured, the interstices everywhere finely punctured, those at the sides slightly transversely wrinkled. Underside and legs black.

Yuyama. Four specimens.

This species has all the structural characters of the genus pointed out by Mr. Baly and Herr von Harold.

Genus MONOLEPTA, Erichs.

MONOLEPTA CYANEA, sp. nov.

Black below, above dark blue; second and third joints of the antennæ testaceous; thorax scarcely visibly, elytra finely punctured.

Length $1\frac{1}{2}$ line.

Head impunctate, with a deep fovea at the middle above the antennæ; the latter two thirds the length of the body, black; the second and third joints testaceous, the latter one half longer than the preceding joint. Thorax one half broader than long, subquadrate, rather convex, the sides rounded before the middle, straight near the base, surface extremely finely punctured. Elytra extremely closely and much more distinctly punctured. Underside and legs black.

Nikko, Yuyama, Miyanoshita, Suyama, Subashiri.

Of the same coloration as *M. flaviventris* in regard to the upper surface, but smaller, the abdomen entirely black, and the antennæ of different colour.

MONOLEPTA FULVICOLLIS, sp. nov.

Black below; head, three lower joints of the antennæ, thorax, and legs fulvous; elytra greenish, closely punctured.

Length $1\frac{1}{2}$ line.

Head with a few fine punctures, only visible under a strong lens, deeply transversely grooved between the eyes, the frontal tubercles narrowly transverse and strongly raised; antennæ black, the basal joints fulvous, second and third joints short and equal. Thorax transverse, fulvous like the head, distinctly but not very closely punctured; the disk with an obsolete transverse depression (accidental?). Elytra not more strongly but more closely punctured than the thorax, the punctuations here and there arranged in lines and distinct to the apices, the latter broadly rounded, not covering the pygidium; legs fulvous; tarsi obscure fuscous; the metatarsus of the posterior legs longer than the three following joints; posterior tibiæ with a distinct spine; anterior coxal cavities closed.

Kashiwagi. A single specimen.

MONOLEPTA DICHROA, Harold, var. (?) APICIPENNIS.

Black; head, thorax, and the apex of the elytra flavous; upper surface very finely punctured.

Length $1\frac{1}{2}$–2 lines.

Head impunctate, transversely grooved between the antennæ, the latter as long as the body, black, the three basal joints testaceous, the second and third very short and subequal. Thorax nearly twice as broad as long, subquadrate, the sides and the posterior margin slightly rounded, the surface impunctate, flavous or fulvous. Elytra convex, slightly widened towards the middle, black, extremely finely punctured, their apices in shape of a triangular spot, the point of which extends upwards at the suture, flavous. Underside and legs black, the anterior tibiæ in some specimens and the knees of all the legs more or less testaceous.

Sapporo. Obtained in more than 20 specimens.

Amongst all the specimens before me, there are two only which answer to the description given by Von Harold of *M. dichroa*, which may be but the variety of the normally coloured individuals with fulvous apices of the elytra, of which I have given the above description. Whichever form is looked upon as the variety, there is little doubt about the identity of the present insect with that of Von Harold.

Genus AENIDEA, Baly.

In this genus several insects have been placed which certainly do not belong to it. In *A. laeta*, Baly, which must be looked upon as the type, the anterior coxal cavites are *closed*; in *A. armata*, Baly, and *A. abdominalis*, Baly, both from Japan, the same cavities are *open* and the last joint of the maxillary palpi is not incrassate. The last-named species ought to find its place in *Phyllobrotica*, with which it has the absent elytral epipleuræ in common as well as all other characters, as the examination of the type in Mr. Lewis's collection has proved to me. That *A. armata* ought to be placed in another genus has already been mentioned somewhere by Herr von Harold.

Aenidea tibialis, sp. nov. (Plate XLVI. fig. 8.)

Fulvous; antennæ fuscous; elytra black, shining, impunctate. Length 2–3 lines.

Head impunctate, deeply grooved between the antennæ; the frontal tubercles strongly developed; carina short and broad; the penultimate joint of the maxillary palpi incrassate. Antennæ nearly as long as the body, slender, the second joint very short, the others rather strongly curved in the male but straight in the female, fuscous or obscure fulvous, their edges covered with rather long pubescence. Thorax transversely subquadrate, the sides straight and narrowed at the base, slightly rounded in front; surface with a transverse fovea at each side, impunctate, fulvous. Scutellum piceous or fulvous. Elytra wider at the base than the thorax, parallel, shining, impunctate. Underside and legs fulvous or flavous, the posterior tibiæ of the male furnished with a short appendage at the apex; the metatarsus as long as the three following joints together. Anterior coxal cavities closed.

Nara, Kobe, Maiyasan, Nikko.

The joints of the antennæ in the male show a curious curvature, and the extreme base of the lower ones is colourless so as to appear almost unconnected with each preceding joint. The thorn-like appendage at the posterior tibiæ in the same sex is another peculiarity of this species, which in coloration partly resembles *A. abdominalis*, Baly. When viewed under a very strong lens, the elytra are seen to be finely granulate with some more distinct punctures. This insect has the typical incrassate terminal joint of the palpi.

Genus Arthrotus, Motsch.

The structural characters of this genus have never to my knowledge been properly pointed out. Chapuis, in his 'Génera des Coléopt.,' placed the genus amongst those whose place was doubtful, and gave no particulars respecting it. An examination of the two species described by Mr. Baly from Japan proves *Arthrotus* to be nearly allied to *Antipha*, Baly. (If it was identical with the last-named genus the author of the latter would not have placed the Japanese species in Motschulsky's genus.) The only difference I can find, however, between the two genera seems to be the more narrowly transverse thorax of *Arthrotus*, the anterior angles of which are acute and produced slightly outwards. The anterior coxal cavities are closed, the tibiæ unarmed, the first joint of the posterior tarsi is nearly as long as the three following together, the claws are appendiculate, and the second and third joints of the antennæ subequal (in the type, *A. niger*, Motsch., they are described as equal and very short). Anyhow *Arthrotus* would find its place in Chapuis's twenty-second group.

CLEROTILIA, n. gen.

Body elongate. Palpi filiform; eyes entire. Antennæ slender, longer than the body, the first joint club-shaped, the second short, the third and following double the length and nearly equal. Thorax transversely subquadrate without depression. Elytra finely semi-punctate-striate, impubescent. Tibiæ unarmed; metatarsus of the hind legs nearly as long as the three following joints together; claws bifid; anterior coxal cavities closed. Elytral epipleuræ continued to the apex.

The bifid claws of this insect compel me to propose the present genus for its reception, which will enter the twenty-sixth group of Chapuis's arangement, the *Platyxanthinæ,* on account of the unarmed tibiæ and closed anterior coxal cavities. The frontal tubercles are very strongly raised, and the antennæ have the apices of their joints thickened.

CLEROTILIA FLAVOMARGINATA, n. sp. (Plate XLVI. fig. 12.)

Pale fulvous; antennæ piceous; head and thorax impunctate; elytra very finely punctured, metallic green or blue, the lateral margin very narrowly flavous.

Length 2 lines.

Head not longer than broad, impunctate; the frontal tubercles trigonate, strongly raised, divided by a narrow groove and bounded behind by another deep depression. Antennæ distinctly longer than the body, piceous, shining, the first joint long, swollen towards the apex, second joint half the length of the third. Thorax one half broader than long, subquadrate, the sides narrowed at the base, the angles slightly tuberculate; surface rather convex, without depression, impunctate, pale fulvous like the head. Scutellum of the same colour. Elytra finely alutaceous or granulate when seen under a strong lens, their surface closely and finely punctured, the punctuation arranged in indistinct rows; green or blue, the extreme lateral margin fulvous; epipleuræ broad, extending to the apex; legs entirely fulvous; claws bifid, the inner division shorter.

Tsumago, Nara.

APPENDIX.

NODOSTOMA VARICOLOR, sp. nov.

Ovate, piceous; antennæ and legs fulvous; head, thorax, and the lateral margin of the elytra metallic green, the disk of the latter fulvous, punctate-striate.

Length $1\frac{1}{2}$ line.

Head finely and remotely punctured, the epistome not separated from the face; eyes large; labrum and palpi fulvous. Antennæ half the length of the body, fulvous, second and third joints equal, the former thickened, the latter thinner than the following joints. Thorax transverse, nearly three times as broad as long, the sides very strongly rounded, but scarcely angulate behind the middle, strongly narrowed in front; surface metallic green, much more strongly punctured than the head but not very closely. Scutellum obscure fulvous. Elytra strongly punctate-striate anteriorly, with a depression below the base, the shoulders prominent, the interstices rather convex at the sides and with a single row of very fine punctures; the disk of the elytra (in shape of a longitudinal band) fulvous, the sutural and lateral margin dark greenish-piceous, extreme lateral margin metallic green, accompanied by a single row of deep punctures. The four posterior tibiæ emarginate at their apices; claws appendiculate.

Hitoyoshi.

This species cannot be considered one of the many varieties of *N. æneipenne*, Motsch., on account of the totally different punctuation of the thorax and the elytra; but I am greatly inclined to believe that *N. varicolor* is equally variable in regard to its coloration.

Nodostoma consimile, Baly.

I am much inclined to believe that this species is but one of the varieties of *N. flavo-pustulatum*, Baly, although the latter is generally smaller, and has the thorax less deeply and strongly punctured. I find, however, both species placed on the same card and bearing the one name *N. consimile* in the author's handwriting.

Nodostoma japonicum, Jacoby.

A further examination of this species proves to me that the insect described by myself under the above name is but a black variety of *N. balyi*, Har., with which it agrees in everything but the colour of the elytra, the head and sometimes the anterior thoracic margin alone remaining of the general fulvous colour.

Leprotes pulverulentus, Jac.

The species published by myself under this name is identical with *Lypesthes ater*, Motsch., of which I have compared a specimen in Mr. Baly's collection (now in the British Museum); Motschulsky was not aware of the powdery white excrescence which covers the elytra of this species in its natural state; the name of "ater" applies therefore only to rubbed specimens, and misled me in describing the species.

I append a complete list of the Phytophagous Coleoptera of Japan, with references to those species mentioned in this and my former communication.

List of the Phytophagous Coleoptera of Japan.

Hæmonia, *Latr.*
japana, *Jacoby.*, p. 190.
Donacia, *Fabr.*
æraria, *Baly.*
simplex, *Fabr.*
gracilipes, *Jac.*, p. 191.
constricticollis, *Jac.*, p. 192.
sericea, *L.*
var. *sibirica*, Solsky?
Syneta, *Lacord.*
adamsi, *Baly.*
Lema, *Fabr.*
concinnipennis, *Baly.*
diversa, *Baly.*
lewisii, *Baly.*
coronata, *Baly.*
honorata, *Baly.*
fortunei, *Baly.*
puncticollis, *Curtis.*
dilecta, *Baly.*
flavipes, *Suffr.*
downesii, *Baly.*

adamsii, *Baly.*
delicatula, *Baly.*
10-punctata, *Gebl.*
CRIOCERIS.
rugata, *Baly.*
parvicollis, *Baly.*
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14-punctata, *Gebl.*
lewisi, *Jac.*, p. 194.
orientalis, *Jac.*, p. 195.
TEMNASPIS, *Lac.*
japonicus, *Baly.*
PEDRILLIA, *Westw.*
annulata, *Baly.*
nigricollis, *Jac.*, p. 195.
varipes, *Jac.*, p. 196.
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CLYTHRA, *Fabr.*
japonica, *Baly.*
læviuscula, *Ratzeb.*
GYNANDROPHTHALMA, *Lac.*
chrysomeloides, *Lac.*
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COPTOCEPHALA, *Lac.*
pallens, *Fabr.*
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OOMORPHUS, *Curtis.*
japanus, *Jac.*, p. 197.
LAMPROSOMA, *Kirby.*
cupreatum, *Baly.*
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CHLAMYS, *Knoch.*
lewisii, *Baly.*
interjecta, *Baly.*
spilota, *Baly.*
japonica, *Jac.*, p. 198.
CŒNOBIUS, *Suffr.*
sulcicollis, *Baly.*
piceus, *Baly.*
DIORYCTUS, *Suffr.*
lewisii, *Baly.*
CRYPTOCEPHALUS, *Geoffr.*
3-fasciatus, *Fabr.*
tetradecaspilotus, *Baly.*
perelegans, *Baly.*
limbatipennis, *Jac.*, p. 199.
partitus, *Jac.*, p. 200.
nigrofasciatus, *Jac.*, p. 200.
difformis, *Jac.*, p. 201.
regalis, *Gebl.*
pilosus, Baly.
instabilis, *Baly.*
liothorax, *Solsky.*
var. *signaticeps*, Baly.
multiplex?, Suffr.
japanus, *Baly.*
mannerheimi, *Gebl.*
fortunatus, *Baly.*
approximatus, *Baly.*
scitulus, *Baly.*
permodestus, *Baly.*
amatus, *Baly.*
discretus, *Baly.*
amiculus, *Baly.*
6-punctatus?, *Linn.*
fulcratus, *Germ.*
nobilis, *Kraatz.*
PACHYBRACHYS, *Suffr.*
eruditus, *Baly.*
dönitzi, Harold.
XANTHONIA, *Baly.*
placida, *Baly.*
LYPESTHES, *Baly.*
ater, *Motsch.*
pulverulentus, Jac., p. 203.
LEPROTES, *Baly.*
lewisi, *Baly.*
DEMOTINA, *Baly.*
fasciculata, *Baly.*
fasciata, *Baly.*
decorata, *Baly.*
modesta, *Baly.*
bipunctata, *Jac.*, p. 204.
BROMIUS, *Chevr.*
japanus, *Motsch.*
ACROTHINIUM, *Marsh.*
gaschkevitchi, *Motsch.*
CHRYSOCHUS, *Redt.*
chinensis, *Baly.*
SCELODONTA, *Westw.*
lewisi, *Baly.*
PARIA, *Leconte.*
variabilis, *Baly.*
robusta, *Baly.*
NODOSTOMA, *Motsch.*
æneipenne, *Motsch.*
fulvipes, Motsch.
atripes, Motsch.
rufotestaceum, Motsch.
balyi, *Har.*
var. *japonicum*, Jac., p. 205.
ruficolle, *Jac.*, p. 205.
modestum, *Jac.*, p. 206.
hirticolle, *Baly.*
consimile, *Baly.*
flavo-pustulatum, *Baly.*
pallidulum, *Baly.*
varicolor, *Jac.*, p. 751.
NODINA, *Motsch.*
chalcosoma, *Baly.*
COLASPOSOMA, *Laporte.*
cyaneum, *Motsch.*
TIMARCHA, *Latr.*
tenebricosa, *Fabr.*
CHRYSOMELA, *L.*
japana, *Baly.*
cyrtonoides, *Jac.*, p. 206.

nikkoensis, *Jac.*, p. 207.
geminata ?, *Payk.*
guttata, *Gebl.*
musiva, Gebl.
subænea, Motsch.
consimilis, Baly.
aurichalcea, *Mannerh.*
angusticollis ?, Motsch.
violaceicollis, Motsch.
ståli, Baly.
quadranguluta, *Motsch.*
obscurofasciata, *Jac.*, p. 208.
GASTROLINA, *Baly.*
thoracica, *Baly.*
japana, *Jac.*, p. 210.
MELASOMA, *Steph.*
ænea, *L.*
japonica, *Har.*
populi, *L.*
20-punctata, *Scop.*
PHYTODECTA, *Kirby.*
rufipes, *Gyll.*
rubripennis, *Baly.*
nigroplagiata, *Baly.*
robusta, *Jac.*, p. 209.
gracilicornis ?, *Kraatz.*
PLAGIODERA, *Redt.*
distincta, *Baly.*
armoraciæ, *L.*
PHÆDON, *Latr.*
brassicæ, *Baly.*
incertum, *Baly.*
GASTROPHYSA, *Redt.*
atrocyanea, *Motsch.*
ŒDIONYCHIS, *Latr.*
vibex, *Erichs.*
japonicus, Baly.
PSEUDODERA, *Baly.*
xanthospila, *Baly.*
HALTICA, *Geoffr.*
cærulescens, *Baly.*
viridicyanea, *Baly.*
picipes, *Baly.*
angustata, *Baly.*
flavicornis, *Baly.*
latericosta, *Jac.*, p. 726.
lewisi, *Jac.*, p. 727.
obscura, *Jac.*, p. 726.
SCALLODERA, *Har.*
fulvipennis, *Baly.*
CREPIDODERA, *Chevr.*
obscuritarsis, *Motsch.*
parvula, *Baly.*
lewisi, *Jac.*, p. 721.
recticollis, *Jac.*, p. 721.
lævicollis, *Jac.*, p. 722.
acuminata, *Jac.*, p. 722.
japonica, *Jac.*, p. 723.
bimaculata, *Jac.*, p. 723.
chloris, *Foudr.*
HERMÆOPHAGA, *Foudr.*
adamsii, *Baly.*
SEBÆTHE, *Baly.*
plagioderoides, *Motsch.*
flavipennis, *Baly.*
HYPHASIS, *Har.*
inconstans, *Jac.*, p. 733.
LIPRUS, *Motsch.*
punctato-striatus, *Motsch.*
hirtus, *Baly.*
suturalis, *Jac.*, p. 725.
nigritus, *Jac.*, p. 724.
minutus, *Jac.*, p. 725.
MANTURA, *Steph.*
rustica, *L.*
fulvipes, *Jac.*, p. 720.
japonica, *Jac.*, p. 720.
PHYLLOTRETA, *Foudr.*
sinuata, *Redt.*
funesta, *Baly.*
tenebrosa, *Jac.*, p. 731.
APHTHONA, *Foudr.*
sordida, *Baly.*
strigosa, *Baly.*
pygmæa, *Baly.*
collaris, *Baly.*
pryeri, *Baly.*
semiviridis, *Jac.*, p. 730.
foudrasi, *Jac.*, p. 729.
LONGITARSUS, *Latr.*
adamsi, *Baly.*
lewisi, *Baly.*
bimaculata, *Baly.*
amicula, *Baly.*
inconspicua, *Baly.*
nitida, *Jac.*, p. 727.
quadraticollis, *Jac.*, p. 729.
orientalis, *Jac.*, p. 728.
hæmorrhoidalis, *Jac.*, p. 728.
lycopi ?, *Foudr.*
parvula ?, *All.*
ARGOPISTES, *Motsch.*
biplagiatus, *Motsch.*
coccinelloides, *Baly.*
unicolor, *Jac.*, p. 738.
11-maculata, *Jac.*, p. 738.
ARGOPUS, *Fisher.*
clypeatus, *Baly.*
balyi, *Har.*
orientalis, *Baly*
nigritarsis, *Fish.*
punctipennis, *Motsch.*
clarki, *Jac.*, p. 734.
nigripennis, *Jac.*, p. 734.
SPHÆRODERMA, *Steph.*
fuscicornis, *Baly.*
seriata, *Baly.*
tarsata, *Baly.*
japana, *Baly.*
separata, *Baly.*
placida, *Har.*
apicalis, *Baly.*
nigricollis, *Jac.*, p. 737.
unicolor, *Jac.*, p. 736.

abdominalis, *Jac.*, p. 736.
atra, *Jac.*, p. 735.
balyi, *Jac.*, p. 735.
APTEROPEDA, *Redt.*
nigropicea, *Baly.*
CHÆTOCNEMA, *Steph.*
granulosa, *Baly.*
chalceola, *Jac.*, p. 731.
japonica, *Jac.*, p. 732.
fulvipes, *Jac.*, p. 732.
aurifrons, *Jac.*, p. 733.
concinnicollis, *Baly.*
cylindrica, *Baly.*
PSYLLIODES, *Latr.*
angusticollis, *Baly.*
punctifrons, *Baly.*
difficilis, *Baly.*
intermedia, *Jac.*, p. 739.
subrugosa, *Jac.*, p. 739.
japonica, *Jac.*, p. 740.
ENNEAMERA, *Har.*
cyanea, *Baly.*
fulva, *Baly.*
tibialis, *Jac.*, p. 740.
MANOBIA, *Jac.*
lewisi, *Jac.*, p. 741.
APHTHONOIDES, *Jac.*
beccarii, *Jac.*, p. 741.
OIDES, *Weber.*
japonicum, *Baly* (*Hornst.*).
ADIMONIA, *Laich.*
extensa, *Motsch.*
capræa, *Linn.*
multicostata, *Jac.*, p. 746.
GALERUCELLA, *Crotch.*
tibialis, *Baly.*
punctato-striata, *Motsch.*
maculicollis, *Motsch.*
vittaticollis, *Baly.*
sagittariæ, *Gyll.*
distincta, *Baly.*
annulicornis, *Baly.*
modesta, *Jac.*, p. 745.
viridipennis, *Jac.*, p. 744.
seminigra, *Jac.*, p. 744.
nigromarginata, *Jac.*, p. 743.
fuscipennis, *Jac.*, p. 746.
semifulva, *Jac.*, p. 745.
AENIDEA, *Baly.*
armata, *Baly* (gen. dub.).
abdominalis, *Baly* (Phyllobrotica).
tibialis, *Jac.*, p. 750.
ornata, *Baly.*
basalis, *Baly.*
nigripes, *Baly.*
CNEORANE, *Baly.*
elegans, *Baly.*
ARTHROTUS, *Motsch.*
niger, *Motsch.*
variabilis, *Baly.*
cyaneus, *Baly.*
GALERUCIDA, *Motsch.*
bifasciata, *Motsch.*
consociata, *Baly.*
lewisi, *Jac.*, p. 747.
eburata, *Har.*
SPHENORAIA, *Clark.*
intermedia, *Jac.*, p. 747.
melanocephala, *Jac.*, p. 748.
AULACOPHORA, *Chevr.*
femoralis, *Motsch.*
nigripennis, *Motsch.*
angulicollis, *Motsch.*
4-plagiata, *Baly.*
LUPERODES, *Motsch.*
4-guttatus, *Motsch.*
discrepans, *Baly.*
pallidulus, *Baly.*
nigripennis, *Motsch.*
DIABROTICA, *Chevr.*
rufotestacea, *Motsch.* (gen. dub.).
AGELASTICA, *Redt.*
nigriceps, *Motsch.*
cærulea, *Baly.*
LUPERUS, *Geoffr.*
moorii, *Baly.*
impressicollis, *Motsch.*
hirsutus, *Jac.*, p. 742.
longicornis, *Jac.*, p. 742.
MONOLEPTA, *Erichs.*
flaviventris, *Motsch.*
nigro-bilineata, *Motsch.*
dichroa, *Har.*
var. *apicipennis*, Jac.
cyanea, *Jac.*, p. 748.
fulvicollis, *Jac.*, p. 749.
PHYLLOBROTICA, *Redt.*
nigrita, *Jac.*, p. 742.
CLEROTILIA, *Jac.*
flavomarginata, *Jac.*, p. 751.

EXPLANATION OF PLATE XLVI.

Fig. 1. *Hyphasis inconstans*, p. 755.
2. *Aphthonoides beccarii*, p. 741.
3. *Phyllobrotica nigrita*, p. 742.
4. *Luperus hirsutus*, p. 742.
5. —— *longicornis*, p. 742.
6. *Galerucida lewisi*, p. 747.
7. *Galeruca multicostata*, p. 746.
Fig. 8. *Aenidia tibialis*, p. 750.
9. *Galerucella viridipennis*, p. 744.
10. —— *nigromarginata*, p. 743
11. —— *semifulva*, p. 745.
12. *Clerotilia flavomarginata*, p. 751.

2. An Account of two Collections of Lepidoptera recently received from Somali-land. By ARTHUR G. BUTLER, F.L.S., F.Z.S., &c.

[Received August 5, 1885.]

(Plate XLVII.)

At the meeting held on the 4th November, 1884, I had the pleasure of bringing before the Society an account of a collection sent to the British Museum by Major J. W. Yerbury from Aden [1].

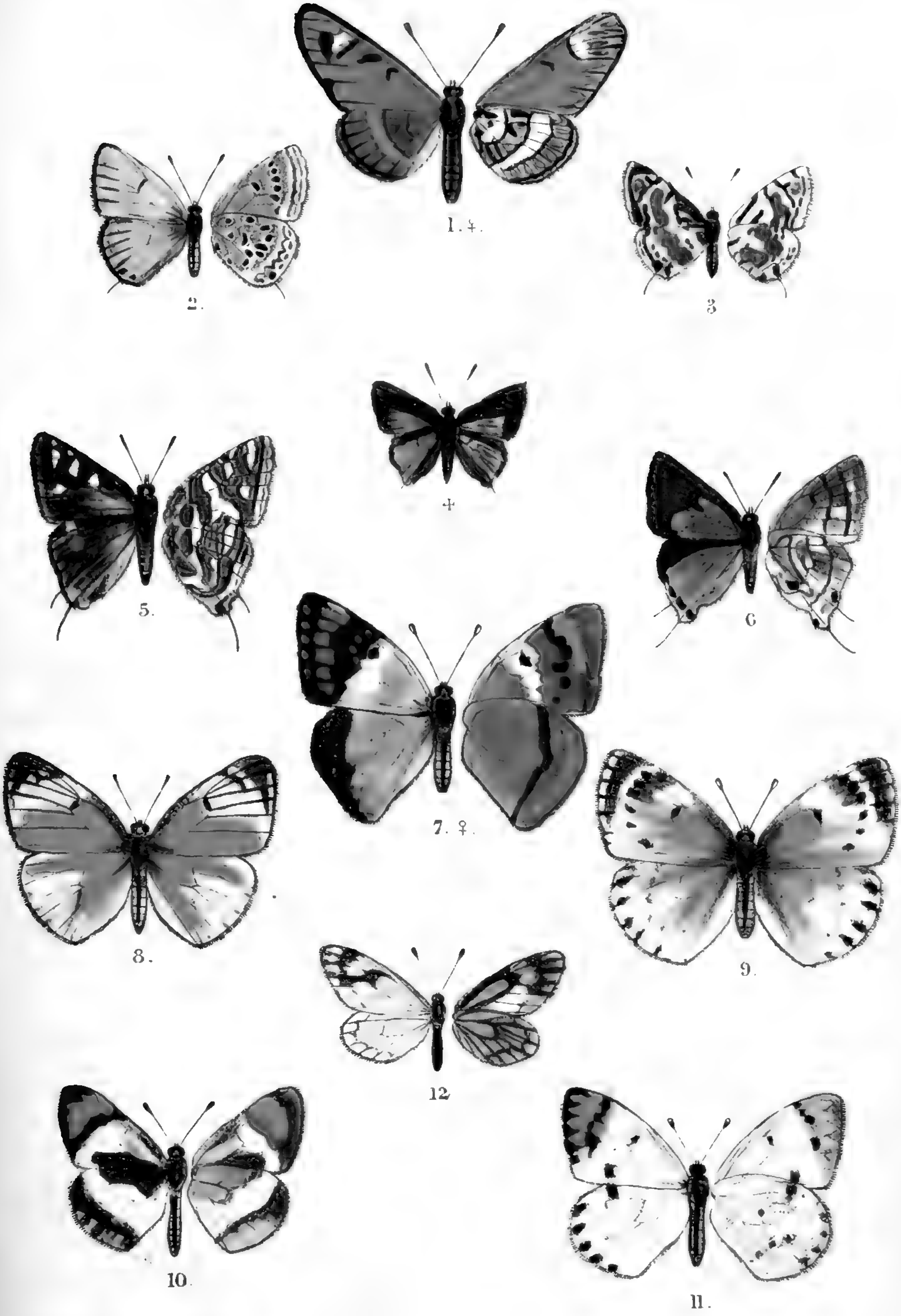
Along with his Aden collection Major Yerbury forwarded to me a small but interesting series collected by him in the spring of 1884 on the Somali coast.

During the present year a second much larger series, collected by Messrs. J. G. Thrupp, Lort-Phillips, and James during an expedition southwards into the interior of Somali from Berbera, was presented by them to the Museum. These Lepidoptera, as I am assured by Mr. Lort-Phillips, were principally obtained upon a plateau commencing at about forty miles from the coast and extending due south for about 200 miles, the time of collecting being about four months.

Since the two collections together contain examples of 55 species, some idea of the geographical relationships of the fauna can be gained from them; the annexed table shows that the relationship to Aden is very strongly marked, no less than twenty-one species being identical and three nearly allied to Aden forms; next in order comes Abyssinia, twelve species identical and nine allied; thirdly, Kilimanjaro, ten, and probably eleven, species identical and three allied; lastly, Natal, nine or ten species identical and fourteen allied.

Omitting from the fifty-five species seven forms not known to exist elsewhere and to which allied types are not yet recorded (so far as I have been able to discover), nearly half the known Butterflies and Moths of Somali are Aden species, a quarter Abyssinian, a fifth Kilimanjarian, and a fifth Natal. The allied or representative types I consider of less importance, especially in the case of so well-worked a locality as Natal when compared with localities so little known as Kilima-njaro or even Abyssinia, from both of which not a few types closely related to those of Somali may confidently be expected to come. On the other hand, if the nineteen new species in these collections be omitted from our calculations, nearly four sevenths of the remainder are identical with species found in Aden. I think, therefore, it may fairly be concluded that the Lepidopterous fauna is essentially Arabian in character; but, since the species of Arabia have a much closer affinity to those of Africa than Asia, it seems reasonable to conclude that they have for the most part immigrated from the African coast and originated in Egypt, Nubia, Abyssinia, and Somali-land.

[1] See P. Z. S. 1884, p. 478.



M. Horman-Fisher del. et lith.

Mintern Bros. imp.

NEW BUTTERFLIES FROM SOMALI-LAND

Table showing the relationship of the Lepidoptera of Somali to those of Aden, Abyssinia, Kilima-njaro, and Natal.

When the species is identical an asterisk * is used, but if a closely allied species replaces it a dagger † is substituted.

	Aden.	Abyssinia.	Kilima-njaro.	Natal.
Limnas dorippus	*			
—— klugii	*	*	*	
Ypthima asterope	*	†		
Neocænyra duplex				
Precis limnoria	......	*	*	
Junonia crebrene	*	*	*	*
Hypanis ilithyia	*	*	......	*
—— castanea	*	* ?	......	†
Hamanumida dædalus	......	*	*	
Acræa chilo	......	......	*	
Acræa bræsia	......	......	*	
Acræa mirabilis				
Polyommatus bæticus	*	*	*	*
Catochrysops asopus	*	......	......	*
—— naidina				
—— fumosa	......	......	......	†
—— lois				
Azanus zena	*	†		
—— jesous	......	*	......	*
Tarucus pulcher	*	......	......	*
—— sybaris	......	*		
—— theophrastus	*			
Castalius lactinatus	......	†		
Hyreus lingeus	......	......	......	*
Spindasis somalina	......	......	......	†
Chloroselas esmeralda				
Hypolycæna umbrosa				
Iolaus glaucus				
Terias zoe	......	......	*	*
Teracolus dynamene	*	......	......	†
—— ocellatus	†	†		
—— chrysonome	......	......	*	
—— protomedia	*	*		
—— heliocaustus	†			
—— præclarus	......	†	......	†
—— eupompe	*	†		
—— dedecora				
—— complexivus	......	......	......	†
—— thruppii	†			
—— jamesii	......	......	......	†
—— phillipsii	......	†	......	†
—— nouna	*			
Catopsilia hyblæa	*			
—— aleurona	*	*		
Belenois lordaca	*	†		
Synchloë distorta	......	......	†	†
Herpænia melanarge	......	†	......	†
Nepheronia arabica	*	......	†	†
Hesperia anchises	*	......	* ?	
Cyclopides cheles	......	......	......	†
Carterocephalus callicles	......	......	......	†
Thanaos djælælæ	*	......	*	*
Eusemia thruppii	......	......	......	†
Saturnia oubie	......	*		
Heliothis peltigera	......	......	......	* ?

Nymphalidæ.

1. Limnas dorippus.

♂ ♀. *Euplœa dorippus*, Klug, Symb. Phys. pl. 48. figs. 1–4.

♂. "Inland from Berbera, April or May 1884."—*Yerbury.*

If my views of the relationship of this species to *L. chrysippus* and allies is correct, it will probably be found that typical *L. dorippus* does not range inland to any very great distance from the Somali coast, but that its place is occupied by its Indo-African representative. So far the two series before me fulfil my expectations; that received from Major Yerbury containing one male of each form, whereas that collected by Mr. Thrupp contains three pairs of the Indo-African form (for which I propose the name of *L. klugii*) and none of *L. dorippus*. Mr. E. Lort-Phillips assures me, however, that three of the specimens were obtained within eighty miles inland from Berbera.

2. Limnas klugii.

♂. *Euplœa dorippus*, var., Klug, Symb. Phys. pl. 48. fig. 5.

♂. "2nd April, 1884."—*Yerbury.*

♂ ♀. Inland, south of Berbera.—*Thrupp.*

This is clearly the prevalent *Limnas* in Somali-land; *L. chrysippus* and *L. alcippus* having, apparently, entirely disappeared, and *L. dorippus* being scarce and in all probability confined to the eastern coast. It therefore has been necessary to give a name to this form, since to speak of it as *L. dorippus* is not in accordance with actual fact.

3. Ypthima asterope.

Hipparchia asterope, Klug, Symb. Phys. pl. 29. figs. 11–14 (1832).

Four specimens, three of them a good deal worn, showing that they had been long on the wing.

Neocœnyra, gen. nov.

Aspect of *Pseudonympha*; neuration of *Ypthima*, excepting that only the costal vein is swollen at the base; palpi and antennæ of *Cœnyra*, from which, however, it is at once distinguished by the form of the discoidal cell of primaries, which does not project in front as in *Cœnyra*, so that (as in *Ypthima*) the second subcostal branch is emitted at a considerable distance beyond the cell: it also differs in having no trace of the large oval blackish brand which occurs on the inner border of the primaries in the male of *Cœnyra*.

4. Neocœnyra duplex, sp. n.

Upper surface smoky greyish-brown, body darker than the wings, the tegulæ slightly rufous in front in the male, wholly rufous in the female: primaries of both sexes with a large pyriform rufous patch [1] covering the anterior part of the disk and enclosing a subapical

[1] This patch is partly greyish in front in the male, but its outline is still clearly visible.

bipupillated orange-zoned ocellus, oval with bluish pupils in the male, rounded with white pupils in the female; a slender blackish submarginal line: secondaries with two unipupillated, rufous-zoned, black, rounded ocelli on the median interspaces; female with a larger, but less widely zoned, indistinct ocellus on the first subcostal interspace and a small ocellus near the anal angle; submarginal line as in the primaries. Below, the primaries in the male are as above, but in the female the rufous patch is outlined with darker rufous and within this line, towards apex, it becomes grey; there is also a spot at the end of the cell and an oblique line in the cell of the same colour, and the submarginal line is rufous; the secondaries in both sexes are rufous at base of costa, those of the male have five ocelli, black, unipupillated, with rufous-edged fulvous irides; one of these is subapical, two on the median interspaces, and two, smaller, on the interno-median interspace; in the female there are four ocelli, there being only one on the interno-median interspace; there are, however, two red dots or rudimentary ocelli between the first and second true ocelli; the entire base of the secondaries is rufous, and there are two irregularly angulated parallel rufous lines which do not exist in the male, also a dot in the cell and an oblique dash at its extremity; the male has two blackish submarginal lines and the female two red ones; pectus of female red at the sides. Expanse of wings, ♂ 33 mm., ♀ 38 mm.

One pair only.—*Thrupp.*

5. Precis limnoria.

Vanessa limnoria, Klug, Symb. Phys. pl. 48. figs. 6, 7 (1845)..

Vanessa naib, Guérin, in Lefebvre's Voy. Abyss. vi. pl. 11. fig. 2 (1849).

One female, somewhat shattered.—*Thrupp.*

6. Junonia crebrene.

Junonia crebrene, Dunning, Trans. Ent. Soc. 1870, p. 524 (1870).

Three females.—*Thrupp.*

7. Hypanis ilithyia.

Papilio ilithyia, Drury, Ill. Exot. Ent. ii. pl. 17. figs. 1, 2 (1773).

♂ ♀.—*Thrupp.*

8. Hypanis castanea, sp. n.

♂. Coloration above of *H. ilithyia* and allies, but the oblique black patch at the end of the cell of primaries widely separated from the oblique band which starts from inner margin and continuous with the submarginal band instead; the latter band also narrower; the subapical costal patch cuneiform, veins and margins very slenderly black; secondaries without the central series of black spots, and with the discal band of only half the width, leaving the submarginal spots large and almost quadrate: primaries below differing much as above; secondaries with the basal, præmedian, and discal bands dull reddish clay-brown; the last-mentioned band, however, with its outer two fifths dull chocolate, edged on both sides with black and with no trace of white spots; the white intermediate bands and the spots beyond the discal band cream-coloured instead of pure white; marginal border dull ochreous crossed by black veins; marginal black-edged stripe dull sordid whitish, its inner edge not undulated. Expanse of wings 52 millim.

One male, taken on the 29th December.—*Thrupp.*

This is probably the *H. anvatara* of Lefebvre (Voy. Abyss., Zool. vi. p. 380), but not of Boisduval.

A pair of this species, from Aden, has recently been sent to us by Major Yerbury, in which the discal black band on the secondaries is slightly broader than in the Somali male, and the discal band below has its outer half dull chocolate-coloured; but in every other respect they correspond with it. The species comes nearest to *H. cora*, Feisth., but is larger, brighter in colouring above, has narrower black bands, and much wider submarginal spots on the secondaries: on the under surface it is more clearly coloured throughout, the external area of primaries is not red-brown, and the bands on the secondaries are decidedly paler, including the marginal stripe, which in *H. cora* is dull brown; the central white band is also more angular.

9. Hamanumida dædalus.

Papilio dædalus, Fabricius, Syst. Ent. p. 482, n. 174 (1775).

More than eighty miles S. of Berbera.—*Thrupp.*

One broken example, of the variety with clay-coloured under surface, upon which the white spots are extremely ill-defined. Every intergrade between this, the true *H. dædalus*, and the *H. meleagris* of Cramer, exists in Abyssinia, and probably in all localities where the species occurs: any attempt to separate the two extremes, as some Lepidopterists have attempted to do, into two species, will probably be futile.

10. Acræa chilo.

Acræa chilo, Godman, P. Z. S. 1880, p. 184, pl. xix. figs. 4, 5.

Dura, December 23rd.—*Lort-Phillips.*

Two male examples were obtained.

11. Acræa bræsia.

Acræa bræsia, Godman, P. Z. S. 1885, p. 538, n. 4.

One male, two females.—*Lort-Phillips.*

I cannot see sufficient grounds for separating this from the Kilimanjaro species, the only differences being that the outer margins of the wings are a little less arched and the spots beyond the cell of primaries rather less oblique; characters which would probably prove to be inconstant if one possessed a good series.

12. Acræa mirabilis, n. sp. (Plate XLVII. fig. 1.)

Wings above bright tawny with rose-coloured shot (probably rose-red in life); extremities of the veins black: primaries with a black spot at the end of cell in the male; the female has a black >-shaped marking in the cell and a black dash at the end; both sexes have an oblique subapical oval white patch on a black ground: secondaries, owing to their transparency, showing a band just before the middle; in the females, however, part of the black outer edge of this band actually exists on the upper surface; this sex also shows a small spot in the cell and a larger spot divided by the upper discocellular veinlet; outer border rather narrowly black, with a paler central stripe: head and thorax tawny, the latter sprinkled with whitish scales; abdomen of male white banded with sulphur yellow, of the female tawny, banded with black and edged with yellow. Primaries below soft tawny, the male with two black discoidal spots, the female with only the terminal black dash of the upper surface; an oblique oval subapical white patch edged internally with black; beyond it and towards the outer margin throughout the veins are black broadly bordered with ash-grey and separated towards the apex solely by short black internervular dashes; secondaries white; basal area spotted with rose-colour; a black subbasal transverse dash from the costal margin to the cell and two or three black subbasal spots; an ash-grey subangulated central band, spotted with tawny and rose-red, margined on both sides with black and enclosing a black spot; veins upon external area black; the latter in the male has no decided inner edge, but is of a pale buff tint, shading into white towards outer margin; in the female, on the other hand, it is sharply defined by a black line and is of a silver-grey tint; in both sexes this area encloses a series of internervular pyramidal orange dashes and is bounded externally by two black lines. Body of male below white, palpi and legs in front buff, sides of pectus spotted with rose-red; body of female below entirely different, the pectus being white, spotted with golden buff similar to the colour of the palpi and front of legs, and the venter golden yellow with two central longitudinal black lines. Expanse of wings, ♂ 37–43 millim., ♀ 47 millim.

Three males. Bunder Maria, 27th April, 1884.—*Yerbury.*

One female. More than 80 miles S. of Berbera.—*Thrupp.*

This marvellously distinct and pretty little species belongs to the group to which the name *Telchinia* has been given, but the banding of the under surface is quite unique.

LYCÆNIDÆ.

13. POLYOMMATUS BÆTICUS.

Papilio bæticus, Linnæus, Syst. Nat. i. 2, p. 789, n. 226 (1767).

♂ ♀.—*Thrupp.*

14. CATOCHRYSOPS ASOPUS.

Lycæna asopus, Hopffer, Ber. Verh. Ak. Berl. 1855, p. 642; Peters' Reise n. Mossamb., Zool. v. p. 410, pl. 26. figs. 13–15 (1862).

One male, var.—*Thrupp.*

15. Catochrysops naidina, sp. n. (Plate XLVII. fig. 2.)

Wings above pale silvery azure, the primaries slighted tinted at the base with green and the secondaries with cobalt; extremities of veins, outer margins, and base of fringes grey-brown; tips of fringes white; primaries with a well-defined brown crescent at extremity of discoidal cell; secondaries with a small blue-speckled black spot above the tail and faint indications of other submarginal spots; body much as usual; under surface of wings silver-grey; markings arranged nearly as in *C. conguensis* of Mabille (Grand. Hist. Mad., Lep. pl. 28. fig. 8[1]), but with the discocellular lunule and series of discal spots of the primaries black, the three spots of the subbasal series of secondaries and the first and last of the discal series also black, the other spots of the discal series more elongated and with two orange-zoned black spots, with metallic silvery-blue streak, instead of one only towards anal angle; this species also has a well-defined tail. Expanse of wings 31 millim.

One male.—*Thrupp.*

Although I have compared this with M. Mabille's figure, on account of the similarity in the pattern of the under surface, I am much mistaken if *L. conguensis* is anything but the ordinary male of *L. asopus,* of which M. Mabille only figures the female.

16. Catochrysops fumosa, sp. n.

Above smoky-brown, slightly sprinkled with blue scales at base; fringe black at base but white externally; secondaries with three indistinct golden-ochreous spots, the central one brightest and enclosing a black spot edged with lilac scales, near the anal angle; body brown with cupreous reflections; wings below stone-grey, marked much as in *C. asopus,* but the discal series of primaries consisting of only five spots and arranged in an arc; secondaries with the five spots nearest to the base black, as in the preceding species; no tail appears to have existed at any time. Expanse of wings 38 millim.

Two males.—*Thrupp.*

We have a Natal species allied to this, but I have not hitherto been successful in identifying it.

17. Catochrysops lois, sp. n.

♂. Bronze-brown, rather dark, the wings with the interno-basal area broadly lilac; secondaries with a small black spot just in front of the tail, edged externally with pure white, a second short white

[1] I cannot mention this book without expressing regret that the beautiful plates should have been entrusted to a Lepidopterist so unskilled as to be unable to tell the sexes of specimens before him; so that on the same plate (pl. 23) I see the males of two distinct species figured as sexes of "*Nymphalis*" *antamboulou*; on plate 38 a female *Catopsilia* (*C. rufosparsa*) is figured as a male, and (on the same plate) the males of two species, so much alike that nobody could question their being nearly allied, are placed one in *Eronia*, the other in *Callidryas*. I will say no more here, beyond the fact that a number of Aden species are wrongly introduced, some of them renamed, and the male of one of them figured along with a Madagascar female belonging to another subgroup of the genus.

line at the extremity of interno-median area; a blackish marginal line; fringe partly whitish. Wings below pale stone-grey, with markings below nearly as in *C. pandava* of India, the primaries having a white-edged brown spot at the end of the cell; a discal band similarly coloured, oblique from costa to second median branch, then a little receding and divided below the second median into two sections; the usual ocelloid marginal spots composed of alternate white and brown lunules and spots; secondaries crossed near the base by three white-edged black spots, that on costa largest; a white-edged brown discocellular lunule; an arched and somewhat sinuous discal series of white-edged spots, the first on costa black, the others slightly separated from it brown, the series almost interrupted below the second median branch; the usual marginal ocelloid spots bounded internally by broad white crescents, the two nearest to the anal angle black: body below white. Expanse of wings 25 millim.

One male. Bunder Maria, 27th April, 1884.—*Yerbury.*

I have been unable to find any described species at all closely allied to this; the nearest species, though wholly differing on the upper surface, is *C. pandava,* but even on the under surface, though agreeing in general pattern, the outline of the markings does not correspond in detail; the anal ocelli also are simply represented by black spots, upon each of which, with the help of a lens, I discovered a single silver scale. The venter in the type is tinted with gamboge-yellow, but I believe that it is stained; if natural, this would be a most unusual colour for any genus of the group allied to *Lycæna.*

18. AZANUS ZENA.

Lycæna zena, Moore, P. Z. S. 1865, p. 505, pl. 31. fig. 9.

One male.—*Thrupp.*

19. AZANUS JESOUS.

Polyommatus jesous, Lefebvre, Voy. Abyss. vi. p. 383, pl. 11. figs. 3, 4 (1847).

♂ ♀. December 23rd.—*Thrupp.*

20. TARUCUS PULCHER.

Lycæna pulchra, Murray, Trans. Ent. Soc. 1874, p. 524, pl. 10. figs. 7, 8.

♂ ♀. December 23rd.—*Thrupp.*

21. TARUCUS SYBARIS?

Lycæna sybaris, Hopffer, Ber. Verh. Ak. Berl. 1855, p. 642, n. 19; Peters' Reise n. Mossamb., Zool. v. p. 408, pl. 26. figs. 6-8 (1862).

One male. Duderi, 26th April, 1884.—*Yerbury.*

The single example obtained differs very slightly from Hopffer's figure, and is apparently referable to the above species.

22. Tarucus theophrastus.

Hesperia theophrastus, Fabricius, Ent. Syst. iii. 1, p. 281, n. 32 (1793).

Lycæna theophrastus, Lucas, Expl. Alg., Zool. iii. pl. 1. fig. 6 (1849).

♂ ♀. December 23rd.—*Thrupp.*

23. Castalius lactinatus, sp. n. (Plate XLVII. fig. 3.)

Allied to *C. cretosus* of Abyssinia. Milk-white; basal markings above as in *C. carana* and *C. cretosus*; external border similar to that of *C. cretosus*, but with larger subapical white spots, with a marginal series of small white spots and shining white-tipped fringe: secondaries with a discal series of six small blackish spots close to the external border, the first two confluent and separated by an interval from the others; external borders bounded internally by a black-brown stripe almost parallel to outer margin and emitting spurs along the veins to the outer margin; between the veins a submarginal series of differently formed black spots, that above the tail being large; marginal line black; tail black, tipped with white: under surface milk-white, all the markings slender and sharply defined; otherwise formed as in *C. calice*, excepting that the whole of the submarginal spots on the primaries, the first and fourth on the secondaries, and the short band across the end of the cell of these wings are wholly absent. Expanse of wings 27 millim.

One female.—*Thrupp.*

24. Hyreus lingeus.

Papilio lingeus, Cramer, Pap. Exot. iv. pl. 379, F, G (1782).

♂ ♀.—*Thrupp.*

25. Spindasis somalina, sp. n. (Plate XLVII. fig. 5.)

Allied to *S. ella* from Natal, but considerably larger; the upper surface with much more brilliant ultramarine-blue shot, and with the spots on the primaries smaller and partly white in the male and pure white in the female instead of ochreous; secondaries more elongated: primaries below snow-white excepting the basal discoidal patch, which is pale buff and encloses two bright metallic plumbageous spots; bands arranged as in *S. ella* excepting that there is a continuous submarginal band (whereas in *S. ella* there are only two short sections, one at costa and one in the middle); all the bands clay-coloured and enclosing series of plumbageous dashes; external border pale buff, excepting towards the external angle, where it becomes gradually white, intersected by a black line and edged externally with black; fringe grey-brown: secondaries pale buff with the exception of central part of the costal half, which is pure white; markings nearly as in *S. ella*, but the subbasal spots more elongated and therefore contiguous, and the bands broader; all these markings clay-coloured, with central bright plumbageous or silvery streaks; external border pale buff, varied with cream-colour and intersected by a black line; marginal line and fringe as in primaries; anal angle creamy white, spotted with black and silver; a large black spot at the angle; tails golden-orange at base, otherwise black with terminal white fringe. Thorax above slaty-grey, collar brown, head white, abdomen clay-brown banded with white. Below, pectus white, legs yellowish; venter white, with a central interrupted clay-brown streak. Expanse of wings, ♂ 29 millim., ♀ 32–35 millim.

♂ ♀. Less than 80 miles S. of Berbera.—*Thrupp.*

♀. Bunder Maria, 27th April, 1884.—*Yerbury.*

CHLOROSELAS, gen. nov.

Allied to *Spindasis*; of the same form. Primaries with a black patch of thickened scales at the end of the cell and at base of second and third median branches; costal vein extending to second third of costal margin; subcostal with only three branches, the first emitted at some distance before the end of the cell, the second and third emitted together from a long footstalk, and terminating upon the costa just before the apex; upper radial emitted from the anterior angle of the cell, lower radial from the centre of the discocellulars, which are transverse; second and third median branches emitted near together; secondaries apparently with only one tail; neuration as in *Spindasis*: palpi broader, more curved, and with shorter terminal joint than in *Spindasis*; antennæ more slender and with more abruptly formed club; anterior legs more slender. Type, *C. esmeralda*.

26. CHLOROSELAS ESMERALDA, sp. n. (Plate XLVII. fig. 4.)

Primaries above with the basi-internal half, excepting the costal border, brilliant flashing emerald-green, changing in certain positions to purple and in others to greyish flesh-colour, the basal half of costa constantly of the latter colour, apical half smoky-brown; a black patch at the end of the cell: secondaries brilliant green, with the costal border rather broadly smoky-brown, abdominal border pale bronze-brown; anal lobe golden-orange, spotted on each side with black and silver. Body above blue-black; head whitish, palpi white, antennæ annulated with white, club tipped with orange, abdomen banded with whitish. Wings below pale sandy testaceous, the wings spotted all over with embossed silver and black: primaries with whitish internal area; a silver spot near the base of the costal border, about six silver spots in the cell, an irregular transverse series of six beyond the cell, two confused discal series of silver and black spots; a submarginal series of partly black-edged silver spots and a nearly marginal series of black dots; fringe white: secondaries with four or five silver spots at the base; a series of four across the basal third followed by slender black dashes, then a forked discal series of silver spots intermixed with six black spots; submarginal series and dots as on primaries; orange, black, and silver lobe as above: body below white. Expanse of wings 21–22 millim.

Bunder Maria, 30th April, 1884.—*Yerbury.*

Major Yerbury obtained three male specimens of this lovely little novelty.

27. Hypolycæna umbrosa, sp. n. (Plate XLVII. fig. 6.)

Nearest to *H. cæculus*; primaries above smoky grey-brown, with a large patch of lavender occupying the basi-internal half; secondaries lavender, costal border and a patch at apex smoky grey-brown; submarginal blackish spots and metallic green anal spots as in the female of *H. cæculus*. Under surface white clouded with pearl-grey: primaries with an orange brownish transverse dash at the end of the cell; a narrow bent dark grey band shot with bright cupreous beyond the cell from costa almost to the submedian vein; a submarginal dark grey stripe tapering from submedian vein almost to the costa, and trisinuate at its anterior extremity; fringe white, spotted with dark grey: secondaries with a bisinuate subbasal grey band brilliantly shot with cupreous orange, a darker oblique dash at the end of the cell, and a zigzag stripe from costa to abdominal margin beyond the cell; a submarginal dark grey stripe tapering from costa to abdominal margin, where it unites with a marginal line which extends almost from the base along this margin; a rounded black spot near the extremity of the first median interspace, and a second upon a metallic green streak at anal angle; a slender black marginal line extending into the tails; fringe white. Expanse of wings 32 millim.

One specimen only was obtained.—*Thrupp.*

28. Iolaus glaucus, sp. n.

Nearest to *I. belli*: primaries above blackish with a large internobasal patch of bright violet, occupying about half the wing; secondaries blackish grey, slightly paler towards the abdominal border, which is almost entirely white; centre of wing densely irrorated with bright violet; a submarginal series of spots, black internally but lilacine whitish externally; a black anal spot bordered internally with bright metallic emerald-green and yellow, and probably a similar spot between the tails[1]; fringe white; a velvety-black patch of thickened scales at base of subcostal branches: wings below chalky-white, with two strongly marked jet-black stripes (the inner one interrupted by the veins on the primaries), and the margin black; the stripes formed as in *I. belli*; the black, green, and yellow anal spot larger than above; a little marginal dash of the same colours above the lobe. Expanse of wings 31 millim.

Duderi, 26th April, 1884.—*Yerbury.*

From any less interesting locality I should hesitate to make a type of a specimen with the secondaries damaged; it is, however, a very distinct species, and there can be little doubt as to the pattern upon the missing parts.

[1] The secondaries unfortunately have a piece broken out of them on both sides, but some metallic green scales are visible at the edge of the broken part on one side, showing that, at any rate, a green spot, if not a black one, exists.

Papilionidæ.

29. Terias zoe.

Terias zoe, Hopffer, Ber. Verh. Ak. Berl. 1855, p. 640, n. 5; Peters' Reise n. Mossamb., Zool. v. p. 369, pl. 23. figs. 10, 11 (1862).

One male.—*Thrupp.*

30. Teracolus dynamene.

Pontia dynamene, Klug, Symb. Phys. pl. 6. figs. 15, 16 (1829).

Var.? *Teracolus carnifer,* Butler, P. Z. S. 1876, p. 138, n. 42, pl. vii. figs. 8, 9.

One male of each form.—*Thrupp.*

M. Mabille has recently figured as the female of this species (which I am satisfied is not found in Madagascar) that sex of Staudinger's recently named Madagascar species *T. castalis,* placed by the latter author in the obsolete genus *Idmais.* Dr. Staudinger is frequently at fault in his generic identifications, though most often his error consists in associating genera utterly different in structure, and whose chief resemblance is one of external facies (as is the case with *Amynthia clorinde,* described and figured in Dr. Staudinger's very pretty book as a *Gonepteryx*), whereas the three groups *Idmais. Callosune,* and *Teracolus,* which, from insufficient material, Dr, Staudinger believes to be distinct genera, do not exhibit a single structural distinction, and, not only that, our collection of these butterflies, which is beyond all question by far the most perfect in the world, shows an almost complete transition, through numbers of nearly allied local forms, from the most *Colias-like Idmais*-form to the extremest type of *Callosune*-form almost resembling a *Leptidia.* It is easy to figure selected species and to say that they are members of different genera; it is just as easy to assert without evidence that intermediate forms have been described from single specimens and therefore may be ignored; but facts remain as they were,—genera founded on good structural characters will alone stand.

31. Teracolus ocellatus, sp. n.

♂. Exactly intermediate between *T. protractus* and *T. phisadia*: primaries only differing from the latter in the straight inner edge to the blue-grey basal area, which agrees with that of *T. protractus,* and in the distinctly white-pupilled black spot at the end of the cell; secondaries like *T. protractus,* excepting that the abdominal half from the base to the border is white as in *T. phisadia*: on the under surface the wings are almost exactly as in the latter species. Expanse of wings 39 millim.

One male.—*Thrupp.*

This is one of the most interesting species in the collection, since it is exactly intermediate between the salmon-coloured *T. protractus* and the salmon and white *T. phisadia.* I have long been looking out for this intergrade, as I was satisfied that it must exist; I have also no doubt that a species intermediate between *T. phisadia* and

T. vestalis will ere long be discovered. *T. phisadia* (from Aden evidently) has been redescribed and figured by M. Mabille under the name of *Idmais philamene*; the form is that figured by Klug as *Pontia arne*.

32. Teracolus chrysonome.

Pontia chrysonome, Klug, Symb. Phys. pl. 7. figs. 9–11 (1829).

♂ ♀. Bunder Maria, 27th–30th April, 1884.—*Yerbury*.

♂ ♀. 2nd January.—*Thrupp*.

The species appears to be tolerably common in Somali-land; it is quite constant in coloration and markings; as may be seen from Klug's figures, the males only have the base of the wings bluish and white.

33. Teracolus protomedia.

Pontia protomedia, Klug, Symb. Phys. pl. 8. figs. 13, 14 (1829).

♂ ♀. Dura, December 23rd.—*Thrupp*.

As usual, this species has not come in good condition; no specimen hitherto sent to the Museum has been quite perfect. *T. protomedia* is another of the Aden species introduced into the fauna of Madagascar by M. Mabille; it is evident that some collection made at Aden has been forwarded to him as from Madagascar. The Lepidoptera of Arabia are peculiar; they do not, in all probability, range further southwards than Somali, and even there they are frequently replaced by allied but distinct species; that they should turn up again, in no respect modified, in Madagascar, is quite out of the question.

34. Teracolus heliocaustus, sp. n. (Plate XLVII. figs. 8, 9.)

Exactly intermediate between the variety *T. miriam* of *T. pleione* and *T. acaste*, in size, pattern, and colouring. The male has the apical border of *T. miriam*, but the orange area is confined by the discoidal cell on the anterior half of the wing, and on the posterior half only differs from that on the primaries of *T. acaste* ♂ in extending to the base; the secondaries have the orange costal area of *T. acaste*, but at the base it fills the discoidal cell and suffuses the interno-median area almost as much as in *T. miriam*; the black discocellular spot on the primaries is formed as in *T. acaste*: the under surface shows the orange basal area of *T. miriam*, but the ochraceous apical area of primaries and entire surface of secondaries of *T. acaste*. The female exhibits the pattern of *T. cœlestis* rather than of *T. acaste*; but the marginal spots are larger than in either; the costal and internal borders of primaries towards the base are dark greyish; the discoidal cell and the whole interno-median area, as far as the discal series of spots, are orange, which colour therefore does not extend quite so far outwards as in the male: on the under surface the pattern is the same as in *T. acaste* ♀, but the basi-internal half of the primaries is orange, the apical border ochraceous, and the secondaries yellow with diffused ochraceous external border and orange basicostal margin. Expanse of wings, ♂ 36–41 millim., ♀ 35–44 millim.

♂ ♀. Bunder Maria, 30th April, 1884.—*Yerbury.*

♂ ♀. Less than 80 miles S. of Berbera.—*Thrupp.*

I have fully expected to receive a species linking *T. miriam* to the *T. halimede* group for some years past; when we receive the male of *T. coliagenes,* I have no doubt it will prove to belong to the latter group, perhaps tending to link it to *T. abyssinicus, T. eris,* and *T. maimuna.*

T. miriam of Aden has been refigured, as from Madagascar, by M. Mabille under the new synonym of *Anthocharis eucheria. Anthocharis* is an obsolete name for the European genus *Euchloe,* which differs from *Teracolus* in neuration in having five subcostal branches instead of four to the primaries, and in the position of the upper radial, which is emitted from the inferior edge of the subcostal vein beyond the cell; these are points which prove *Euchloe* to belong to a different section of the subfamily from that to which *Teracolus* belongs.

The two forms of *T. pleione,* which scarcely differ and certainly interbreed, have now been described four and figured three times.

35. Teracolus præclarus, n. sp. (Plate XLVII. fig. 7.)

Allied to *T. amina,* the male on the upper surface only differing in the greater width of the blackish border and the absence of marginal spots, the female differing also in its yellower colour (the base of the primaries and whole of secondaries up to the border being yellow); the blackish apical half of primaries irrorated with carmine, crossed by seven spots of this colour and with six marginal carmine dots: under surface entirely distinct from *T. amina,* the primaries with the basal three fifths of the discoidal cell cadmium-yellow, shading into lemon-yellow towards the costa and vermilion towards its outer extremity; female also with a broad submedian streak of vermilion, a round black spot at the end of the cell; a central white belt enclosing the black spot, beyond which the whole disk, with the exception of a triangular apical patch, is bright rose-red and crossed by an angular series of black spots; apical patch yellow and quadrifid internally, dark ochraceous flesh-coloured externally: secondaries lemon-yellow, with the basi-abdominal area in the male yellowish flesh-coloured, and in the female bright gamboge-yellow; the external area ochraceous flesh-coloured, bounded internally by an angular lilacine brownish macular band enclosing a series of bright yellow crescents: body below whitish. Expanse of wings, ♂ 43 millim., ♀ 48 millim.

One pair, the male taken by Mr. Thrupp and the female by Mr. Lort-Phillips, who captured it with his fingers whilst it was hovering about the flowers of a *Mimosa* or similar shrub.

This is one of the most distinct, beautiful, and at the same time interesting species yet discovered. I have long been looking for evidence that *T. amina* and *T. celimene* are intermediate (as they appear to be) between the two groups to which the names

Idmais and *Callosune* were formerly given. *T. amina* has much of the pattern of *T. vesta* and its allies on the under surface, but both sexes correspond more nearly with the *T. ione* group on the upper surface; *T. pholoë*, from Lake N'Gami, is evidently a female allied to *T. amina*, but having two series of magenta spots across the black area of the primaries; it may even be a dimorphic form of the female of *T. celimene* from Abyssinia, which is described as having two series of yellowish-white spots across this area: all these have the "*Idmais*" type of marking on the under surface. On the other hand, the species from Somali, though on the upper surface much like *T. amina* and (evidently) *T. pholoë*, differs in having the under surface coloured more nearly as in *T. zoe* of Madagascar, a species intermediate in character between the *T. halimede* and *T. ione* groups, and thus links the so-called genera *Idmais* and *Callosune* at another point, proving that even in their pattern they are completely linked and interlocked beyond the possibility of separation.

36. Teracolus eupompe.

Pontia eupompe, Klug, Symb. Phys. pl. 6. figs. 11–14 (1829).

Two male specimens.—*Thrupp*.

The males are chiefly distinguishable from the following by the magenta-shot colour upon the crimson apical patch, the usually much broader blackish inner border to this patch, and the more distinct markings on the under surface.

37. Teracolus dedecorus.

Anthopsyche dedecora, Felder, Reise der Nov., Lep. ii. p. 184, n. 177 (1865).

♂. Duderi, 26th April; Bunder Maria, 27th April.—*Yerbury*.

♂ ♀. Somali, 23rd December.—*Thrupp*.

Some examples have no series of discal spots across the secondaries on the under surface, whereas others are nearly as strongly marked as in *T. eupompe*. This appears to be an inconstant character in the present species, as one out of three males from Duderi has these markings obliterated, a second has them half across the wing, and the third has a complete series and much resembles males of *T. dulcis*; the tint of the under surface also varies as in *T. subroseus*.

38. Teracolus complexivus, sp. n.

♂. Upper surface almost exactly as in the male of *T. omphaloides*, differing in the orange instead of vermilion apical patch, and in the diffuse character of the posterior extremity of the black border. On the under surface it corresponds more nearly with the male of *T. theogone*, the apical area of primaries being precisely similar excepting that perhaps the red patch is a little more diffused; the secondaries are however decidedly paler, of a clear pink colour with a broad grey costal border extending from the base to the brown costal spot; the discal brown stripe is well defined but the spot at the end of the cell extremely minute. Expanse of wings 45 millim.

One male. January 2nd.—*Thrupp*.

This is an intergrade which I had not expected to see, combining the colouring on both surfaces of *T. loandicus* with the pattern of *T. omphaloides*.

39. TERACOLUS THRUPPI, sp. n. (Plate XLVII. fig. 10.)

♂. Allied to *T. daira* and *T. yerburii*, but the primaries in their markings more like *T. suffusus* of Angola. Milk-white, costal border slightly greyish, the margin narrowly black; apical third to first median branch occupied by a black-brown triangular patch enclosing a lunate orange patch composed of six more or less elongated spots divided only by the black veins; outer margin towards external angle narrowly dusky; a broad blackish internal band from base to external third, and widest in the middle; secondaries with the basi-costal third (excepting upon the abdominal area) blackish; external border from submedian vein to apex broadly blackish, interrupted on the median and submedian interspaces by squamose white marginal spots; body black, tegulæ with whitish and greyish fringe. Primaries below white, discoidal area sulphur-yellow, irrorated in front with grey; a large and almost semicircular subapical orange patch, its inner border slightly sordid, bounded outwardly by a broad greenish external border which terminates on the first median interspace; internal band broader than above, grey, becoming blackish at the outer extremity: secondaries white, the basicostal third pearl-grey suffused with pale sulphur-yellow, which gives it a greenish tint; basal half of costal margin deep orange; a dusky oblique costal dash terminating the basicostal area; a small fusiform orange spot dotted with black at the end of the cell; external border pale yellowish, bounded internally by an unequal diffused olive-brownish band: body below white. Expanse of wings 36 millim.

♀. Primaries narrower, more rounded, the subapical patch replaced by a very oblique orange band composed of four elliptical sections separated only by the veins, and bounded internally by a narrow line of black, so that the apical area is decidedly smaller and its inner edge has a more defined angle than in the male; fringe white instead of black; internal blackish band of nearly equal width throughout: secondaries much shorter, with six unequal black marginal spots, the second and third large and followed by a grey submarginal band, so as to enclose four reniform pale yellowish spots between the black marginal spots: under surface yellower, the olive greenish apical area of primaries replaced by pale sulphur-yellow sparsely irrorated with grey, the orange band narrower, clearer in colour and more oblique, the secondaries sulphur-tinted throughout, with the basal area irrorated with grey, the discocellular spot better defined, and the submarginal band grey instead of olive-brownish. Expanse of wings 31 millim.

One male, two females, January 2nd.—*Thrupp*.

40. TERACOLUS JAMESI, sp. n.

♀. Allied to *T. phlegetonia*, *T. minans*, *T. interruptus*, and *T. friga*; but at once distinguished by its smaller size, the absence of a black discocellular dot on the primaries, the position of the nebulous grey discal band on the secondaries, which is much further from the outer margin, and the paler and more delicate colouring on both surfaces. Its general aspect is that of *T. friga* (P. Z. S. 1876, pl. vi. fig. 5, ♀); but, in addition to the absence of the discocellular dot, the wings are whiter, the oblique subapical band is narrower, more oblique than in the figure, bounded throughout with orange, the outer border is more acutely dentated and terminates in a small black spot; the internal streak extends from the base, is grey throughout; the spot on the disk of secondaries is continued as a streak tapering to the submedian vein, and the marginal border is replaced by six blackish spots: on the under surface it is quite different, being similar to, but much paler than, the female of *T. eione*. Expanse of wings 28–33 millim.

Two females.—*Thrupp*.

There is not the least doubt that many Lepidopterists who did not possess abundant material would have put down *T. jamesi* as the female of *T. thruppii*, overlooking the differences between the sexes of that species, and regarding them all as males; yet there can be no question that it belongs to a different subgroup, the males of which invariably have a transverse blackish discal spot or dash upon the orange apical area, as in *T. friga*, ♂ (see figure in P. Z. S. 1876); whereas the females of the *T.-daira* group nearly resemble the males, both having the orange apical patch bounded internally by a black line, stripe, or band.

41. TERACOLUS PHILLIPSI, sp. n. (Plate XLVII. fig. 11.)

Nearly allied to *T. evarne*. The male differing in its pure white colour, smaller and less brilliant orange apical patch, with much narrower sulphur-yellow edging, the very narrow black margin to the primaries, absence of marginal spots in the secondaries; primaries below white instead of sulphur-yellow, the apical patch sulphur-yellow, with pale pink inner edging instead of creamy ochraceous, and with three well-defined subapical brown dots in an oblique series: secondaries creamy white, shorter than in *T. evarne*, with only the costa slightly yellowish. The female differs above in its whiter colouring, much better-defined black markings, the subapical spots forming a continuous irregular stripe, the much smaller orange apical area, and the entirely different coloration of the under surface, which closely resembles that of *T. eucharis* ♀. Expanse of wings, ♂ 42 millim., ♀ 40 millim.

One male and three females.—*Thrupp*.

Var. *a*. Smaller; the orange apical area of male narrower, with concave rather than convex inner edge, the black border reduced to a few apical marginal dots; under surface of primaries with the subapical dots reduced to two, and orange instead of brown; the female altogether paler, with smaller black markings, the subapical spots separate as in *T. evarne* ♀, the apical area only irrorated with orange, so that it appears to be flesh-coloured; the under surface altogether whiter (but occasionally with pinkish secondaries), with less strongly-defined markings. Expanse of wings, ♂ ♀ 37 millim.

One male and three females.—*Thrupp.*

Two males. Duderi, 26th April, 1884.—*Yerbury.*

Var. *b.* Still smaller, the male with apical patch as in the type, but more broadly bordered internally with sulphur-yellow; black marginal edging only indistinctly seen with the help of a lens; under surface of primaries as in var. *a*, of secondaries pale pink with base of costa orange: the female with the apical patch much paler than in var. *a*, the marginal spots wanting, the discal spots ill-defined; the markings of the secondaries obsolete, the markings of the under surface faintly indicated in olivaceous, instead of deep brown, the secondaries pink-tinted. Expanse of wings, ♂ ♀ 35 millim.

One male, two females, 2nd January.—*Thrupp.*

The three forms which I here associate under one specific name are doubtless representatives of the three supposed species taken by Col. Swinhoe in Bombay, viz. *T. pseudevanthe, T. titea,* and *T. eucharis*; whether they are distinct or not can be decided only upon the spot by careful successive experiments in breeding. Therefore, whilst I refrain from asserting that the Indian types are mere varietal forms, I equally refrain from separating as species the three gradational types found in Somali until more is known concerning them. The male of the form taken by Major Yerbury (var. *a*) somewhat resembles Klug's figure of *T. liagore* ♂; his supposed female is a male of a distinct species allied to *T. glycera.*

42. Teracolus nouna.

Anthocharis nouna, Lucas, Expl. Algér., Zool. iii. p. 350, n. 14, pl. 1. fig. 2 (1849).

One male. Bunder Maria, 27th April, 1884.

This is evidently a wide-ranging species. Major Yerbury obtained only one example on the Somali coast; it agrees in all respects with males from Aden, excepting that the orange subapical dash on the under surface of the primaries is a little less red in tint.

43. Catopsilia hyblæa.

♀. *Callidryas hyblæa,* Boisduval, Sp. Gén. Lép. p. 612, n. 11 (1836).

♂ ♀. *Catopsilia hyblæa,* Butler, P. Z. S. 1884, p. 487.

♂ ♀. More than eighty miles south of Berbera.—*Lort-Phillips.* Three males and one female obtained.

44. Catopsilia aleurona.

♀. *Catopsilia aleurona,* Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xviii. p. 489 (1876); ♂, P. Z. S. 1884, p. 487.

♂ ♀. Less than eighty miles south of Berbera.—*Lort-Phillips.*

These two species of *Catopsilia* were taken with the fingers whilst settling near water; of the latter species only a single rather worn pair was obtained.

45. Belenois lordaca.

Pieris lordaca, Walker, Entom. v. p. 48.

Three males, two females. 2nd January.—*Thrupp.*

Only one male was taken less than eighty miles south of Berbera.

46. Synchloe distorta, sp. n. (Plate XLVII. fig. 12.)

♀. Pale sulphur-yellow; all the nervures above greyish, owing probably to the semitransparency of the wings, which allows the pattern of the under surface to be seen; costal margin of primaries blackish; a cuneiform and somewhat curved black patch at the end of the cell, uniting on the third median branch with the apical border, which is formed as in *S. hellica*, and encloses similar oval spots of the ground-colour; the black spot below the first median branch of *S. hellica* is here only indicated by a minute blackish dot, and the secondaries show no more of the dentate-sinuate submarginal line than in the male of that species. Below, the wings are decidedly yellower than above; all the veins are grey-brown irrorated with yellow, which gives them an olive tint: primaries with the patch at the end of the cell formed as above, confluent, with a greyish basi-costal border, not black as above, but greyish sprinkled with yellow atoms; two paler but similarly coloured patches, representing the inner portion of the apical border, but placed further from the margin than in *S. hellica*; submedian dot rather larger than above: secondaries with the veins more broadly bordered than on the primaries, and connected by a submarginal dentate-sinuate yellow-sprinkled grey stripe. Expanse of wings 33 millim.

One female. More than eighty miles south of Berbera.—*Thrupp.*

Only one female was obtained, which, from its small size and narrow wings, I at first imagined to be only a starved specimen of some well-known species. Upon comparing it, however, with *S. hellica* and allies, it is clearly seen to be perfectly distinct, the dark veins of the primaries being peculiar to it. The specimen is in all probability somewhat starved, which would account for its small size and narrow wings; but the other characters would be amply sufficient to distinguish it specifically.

47. Herpænia melanarge, sp. n.

♂. Nearest to *H. tritogenia*: smaller, wings blacker, pale markings of a uniform cream-colour; oblique patch at end of cell less irregular, subapical spots larger; central submarginal spot smaller; dot at extremity of first median interspace obsolete; oblique band from internal margin much narrower, more or less divided above the first median branch; black band from abdominal margin of secondaries differently shaped, widest instead of narrowest at this margin, its inner edge forming a slight regular arch to the subcostal vein; outer border broader; apical area of primaries and whole of secondaries below tinted with pink, the markings bronze-brown (not yellowish brown); the pale bands being narrower, and the darker ones consequently broader than in *H. tritogenia*. Expanse of wings 44 millim.

Three male specimens. More than eighty miles south of Berbera. —*Thrupp.*

48. NEPHERONIA ARABICA.

Eronia buquetii, var. *arabica*, Hopffer in Peters' Reise nach Mossambique, Zool. v. p. 363, var. *β* (1862).

Nepheronia arabica, Butler, P. Z. S. 1884, p. 492, n. 37.

One female. More than eighty miles southwards of Berbera.—*Thrupp.*

HESPERIIDÆ.

49. HESPERIA ANCHISES.

Ismene anchises, Gerstaecker in Van der Decken's Reisen in Ost-Africa, iii. p. 374, n. 29, pl. xv. figs. 6, 6 *a* (1873).

One pair, 23rd December.—*Thrupp.*

50. CYCLOPIDES CHELES.

Cyclopides cheles, Hewitson, Descr. Hesp. p. 42, n. 5 (1868).

One male.—*Thrupp.*

Allied to *C. mene* of Cramer.

51. CARTEROCEPHALUS CALLICLES.

Cyclopides callicles, Hewitson, Descr. Hesp. p. 42, n. 6 (1868).

Two males.—*Thrupp.*

Nearest to *C. macomo.*

The two preceding species were originally described from specimens received from Damara-land. We have *C. callicles* also from Kinsembo.

52. THANAOS DJÆLÆLÆ.

Pterygospidea djælælæ, Wallengren, Lep. Rhop. Caffr. p. 54 (1857).

One damaged specimen.—*Thrupp.*

AGARISTIDÆ.

53. EUSEMIA THRUPPI, sp. n.

♀. Allied to *E. superba*[1], but the spots on the thorax and at base of primaries yellow, the latter extending to basal fourth, where they form a sinuous series; the first pair of larger spots differing in that the anterior spot is of only about a third the size of that in *E. superba*, and the lower spot is cuneiform and rests on the inner margin; the other spots on the wing differ but little: secondaries with the apical two thirds orange-ochreous, changing below the cell to rose-red; external border about half the width of that of *E. superba*, and without the white apical spot of that species; abdomen shining fulvous, becoming redder towards the base, not banded with black as in all the allied species. Expanse of wings 80 millim.

One female. More than eighty miles south of Berbera.—*Thrupp.*

[1] In the Museum from Natal, Zulu Land, and Nyanza.

SATURNIIDÆ.

54. SATURNIA OUBIE.

Bombyx oubie, Guérin, Voy. in Abyss. pl. 12. figs. 1, 2.

Saturnia zaddachii, Dewitz, Mitth. d. Münch. Ver. 1879, Taf. ii. fig. 6.

Four females, all more or less damaged.—*Thrupp.*

From the figures of this species I had always supposed it to be allied to *Antheræa tyrrea* (which, however, is hardly a typical *Antheræa*). In coloration it corresponds with *A. belina*, and in pattern, excepting for its pale nervures, with *A. hersilia*. After careful examination of all its structural characters, however, it appears not to differ from typical *Saturnia*; the antennæ, with their alternate unequal serration, the short palpi, short proboscis, legs, and nervures, including the apical furcation of the subcostal branches, all correspond with those of the female *S. pavonia-major*, and yet the pattern is distinctly that of the African representatives of *Antheræa*.

I can find no reason for separating *S. zaddachii* from *S. oubie*; as Herr Dewitz does not mention the figure by M. Guérin, it was most probably overlooked by him; at the same time I should greatly prefer to use the later and less barbarous name if it were possible.

One of the specimens obtained by Mr. Thrupp shows a curious modification of wing-structure, the upper radial of the left-hand primary being united by a cross-vein to the last subcostal branch.

HELIOTHIDÆ.

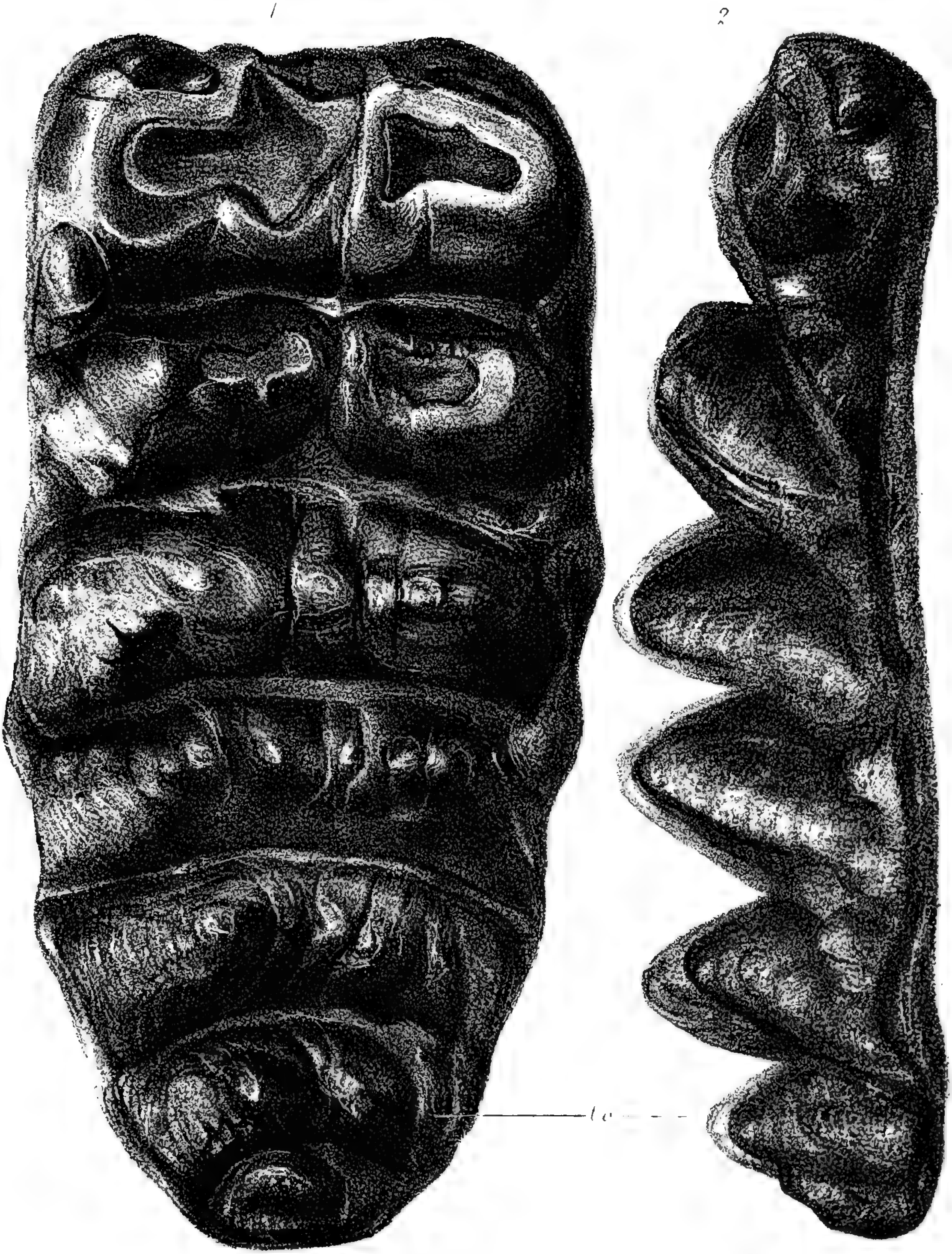
55. HELIOTHIS PELTIGERA.

Noctua peltigera, Denis & Schiffermüller, Wien. Verz. p. 89, n. 2.

One example, marked simply "Somali coast."—*Yerbury.*

EXPLANATION OF PLATE XLVII.

Fig. 1. *Acræa mirabilis*, ♀, p. 760.
2. *Catochrysops naidina*, p. 762.
3. *Castalius lactinatus*, p. 764.
4. *Chloroselas esmeralda*, p. 765.
5. *Spindasis somalina*, ♀, p. 764.
6. *Hypolycæna umbrosa*, p. 766.
7. *Teracolus præclarus*, ♀, p. 769.
8, 9. —— *heliocaustus*, ♂, ♀, p. 768.
10. —— *thruppi*, ♂, p. 771.
11. —— *phillipsi*, ♀, p. 772.
12. *Synchloe distorta*, p. 774.



From nat. on Stone by J. Erxleben

Hanhart imp.

MASTODON LATIDENS.

3rd left upper molar.

3. Description of a Tooth of *Mastodon latidens*, Clift, from Borneo. By R. Lydekker, B.A., &c.

[Received August 18, 1885.]

(Plate XLVIII.)

The specimen forming the subject of the present notice was forwarded from Borneo to the Secretary of this Society by Mr. A. H. Everett, C.M.Z.S., who stated that it was found during the early part of the present year by a Kadayan in the jungle in the vicinity of Bruni, on the north-west coast of Borneo. Owing to the country being in a disturbed state Mr. Everett could not visit the locality to make further inquiries; but there seems no doubt that the history of the specimen is a true one.

The specimen is the crown of the last left upper true molar of a tetralophodont *Mastodon*, and agrees so closely with Indian teeth of the Siwalik *Mastodon latidens*, Clift [1], that it may be safely referred to that species, although it indicates a very small individual. In mineralogical condition the specimen agrees very closely with many Burmese specimens of the teeth of the same species, although its colour is rather darker than is usually the case. The crown carries five low transverse ridges, and a well-marked hind talon (*ta*); each ridge extends straight across the crown, and the intervening valleys are quite open and uninterrupted by accessory tubercles; there is a very small quantity of cement at the base of the hinder valleys. Each ridge is divided into an inner and an outer moiety by a longitudinal cleft, which is placed nearest to the outer border of the tooth. The first two ridges are partially worn, and show dentine islets; the third is very slightly worn, but its enamel is not perforated; while the fourth and fifth, together with the talon, are untouched; the third and fourth ridges show that there are four cusps on the inner and two on the outer side of the longitudinal cleft. The inner moieties of the first and second ridges present dentine islets with a very imperfect trefoil shape; and when more worn the islets of the inner and outer moieties would unite and form transverse bands. On the anterior aspect there is a disk caused by the pressure of an adjacent molar, but the posterior aspect exhibits no such disk; these features, together with the characteristic shape of the crown and the number of ridges, show that the tooth is the last of the true molar series.

Compared with the large series of Indian and Burmese teeth of *Mastodon latidens* figured by the present writer in the 'Palæontologia Indica' (Mem. Geol. Surv. India [2]), the present specimen agrees precisely in all general characters. The only other species to which it presents any resemblance is the Indian *M. perimensis*, of which characteristic teeth are figured in the same work [3]; but it is

[1] Trans. Geol. Soc. ser. 2, vol. ii. pt. 3, p. 371 (1828).
[2] Ser. 10, vol. i. pls. xxxvii.–xxxix (1880).
[3] Vol. i. pls. xl., xlii., and vol. iii. pl. xvi.

readily distinguished by the lower ridges, open valleys, less distinct dentine trefoils, and much smaller quantity of cement. Compared with the large unworn third right upper true molar of *M. latidens* from the Punjab, figured in plate xxxix. of the first volume of the work cited [1], it will be seen that the Borneo specimen agrees in the number of ridges (although the hind talon is considerably smaller), but is of greatly inferior size, the dimensions of the two specimens being as follows, in inches :—

	Punjab.	Borneo.
Extreme length	8·6	6·3
Width of first ridge	4·2	2·95

In plate xxxi. figs. 3, 3*a*, of Falconer and Cautley's 'Fauna Antiqua Sivalensis' there is figured on a reduced scale part of the right maxilla of an example of *M. latidens* from Burma (of which there is a cast in the British Museum) exhibiting two molars, which in the description of the plate [2] are provisionally regarded as the last milk- and the first true molar. This determination was accepted by the writer (who had not then seen the specimen) in the 'Palæontologia Indica,' [3] although it was remarked that the form of the second tooth (which carries five ridges and a talon) must, on this view, be abnormal. A comparison of that specimen with the Borneo tooth shows that the second tooth in the former must be likewise the last true molar; and as its dimensions are $5{\cdot}6 \times 2{\cdot}9$ inches, it indicates an individual agreeing very closely in size with the one to which the Borneo tooth belonged. This Burmese specimen is also figured by Clift in the Trans. Geol. Soc. ser. 2, vol. ii. pl. xxxvii. fig. 1, and is one of the types. There is a very similar tooth in the British Museum (no. 37253) from Perim Island.

The descriptive part of this paper may therefore be concluded by observing that the specimen under consideration indicates the occurrence of *M. latidens* in Borneo; and also that a small race of the species existed both there and in Burma. The smaller race was apparently of rare occurrence in the latter country; and it will be extremely interesting if future finds should show that the island form always belonged to this race.

Coming now to distributional considerations, it may be observed that *Mastodon latidens* occurs in Perim Island in the Gulf of Cambay [4], and thence may be traced [5] through Sind, the Punjab, and the Western Himalaya to Burma; from which point the present specimen extends its range to Borneo. The present writer has already shown [6] that some of the species of Indian Siwalik stegodont

[1] Owing to an inadvertence of the artist the specimen is viewed from the outer instead of from the inner side.

[2] 'Falconer's Palæontological Memoirs,' vol. i. p. 463 (1868).

[3] *Op. cit.* vol. i. pp. 231–232.

[4] Specimens in Brit. Mus.

[5] 'Palæontologia Indica,' *op. cit.* vol. i. pp. 228, 229.

[6] *Ibid.* vol. i. pp. 256 *et seq.*, 268 *et seq.*; vol. ii. p. 289 (in this passage *Elephas bombifrons* is erroneously given for *E. insignis*); and Rec. Geol. Surv. Ind. vol. xvi. pp. 158–161 (1883).

Elephants ranged into China; and Dr. E. Naumann[1] has indicated the occurrence of several of these species in Japan; while more recently Herr K. Martin has described and figured[2] some fragments of molars of a stegodont Elephant from Java, which he thinks may probably belong either to *Elephas insignis* or *E. bombifrons*[3]. At a still later date teeth of Siwalik species of *Elephas* and *Mastodon* have been described by Dr. E. Koken[4] from Western China.

It thus seems that the Pliocene proboscidean fauna of India extended into the extreme east of Asia, where, from its association with *Elephas namadicus* and *E. primigenius*[5], it probably persisted into the Pleistocene. As much interest will attach to the discovery of other remains of the Order from these regions, the attention of travellers and collectors may be particularly directed to their acquisition.

It may be added that *Mastodon latidens* is an interesting form, since it is one that apparently passes insensibly into other species. Thus the normal number of ridges in the "intermediate" molars is four, but a fifth is occasionally present[6], in which case there is but one step to the simplest of the stegodont Elephants, viz. *Elephas clifti*, in which there are six ridges. In the opposite direction, by a slightly increased development of accessory columns and the heightening of the ridges, an approach is made to the tetralophodont *M. perimensis*, and although typical teeth of the two species are very distinct, yet there are specimens in the British Museum of which it is very difficult to say to which species they belong. The tetralophodont *M. perimensis* appears again to show indications of passing into *M. pandionis*[7], in which the intermediate molars have but three ridges. Not only is there, therefore, no real distinction between *Mastodon* and *Elephas*, but it is more than doubtful whether individual species of the two can be always differentiated.

DESCRIPTION OF PLATE XLVIII.

The third left upper true molar of a dwarf race of *Mastodon latidens*, in an early stage of wear, from near Bruni, Borneo. The specimen is drawn of the natural size, as viewed from the grinding-surface (fig. 1) and from the outer side (fig. 2); *ta*, hind talon.

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[1] 'Palæontographica,' vol. xxviii. art i. (1881). See also 'Palæontologia Indica,' *op. cit.* vol. ii. pp. 65–66.

[2] 'Beiträge z. Geol. Ost-Asiens und Australiens,' in Sammlungen d. Geol. Reich. Mus. in Leiden, no. 10 (1884).

[3] Herr Martin mentions a previous notice by Junghun in 1857 of similar remains discovered by himself in the mountains of Pati=Ajam, near Japara, in Java.

[4] Palæontologische Abhandlungen, vol. iii. pt. 2 (1885).

[5] *Vide* Naumann, *op. cit.*

[6] *Vide* Pal. Ind. ser. 10, vol. i. pl. xxxviii.

[7] *Ibid.* vol. iii. p. 153.

4. A Monograph of the Genus *Paradoxurus*, F. Cuv. By W. T. Blanford, F.R.S.

[Received August 19, 1885.]

(Plates XLIX. & L.)

I have recently had occasion to prepare, for a forthcoming work on Indian Mammalia, an account of the species of *Paradoxurus* inhabiting India, Burma, and Ceylon. In the course of my work I have found it necessary to examine in detail the literature relating to the different forms, and I have come to conclusions differing somewhat from those hitherto published on the subject. It may perhaps be of use to those who have occasion to deal with species belonging to the genus, which are by no means easy to determine, if I state the results of my inquiries and extend them to all the species belonging to this generic type.

My work has been principally based on the collection of skins and skulls in the British-Museum collection, in examining which I have received much assistance from Mr. Oldfield Thomas, who had already arranged the specimens to a considerable extent, and to whom I am indebted for much information and for many suggestions.

The latest attempt at an arrangement and definition of the species belonging to the genus and its allies was made, so far as I can ascertain, by the late Dr. J. E. Gray in his revision of the genera and species of Viverrine animals. This appeared in the Proceedings of the Society for 1864, and was republished, with a few additional notes and references, in the 'Catalogue of Carnivorous, Pachydermatous, and Edentate Mammalia in the British Museum' (1869). In the classification there adopted, nine species of *Paradoxurus* are admitted, besides three of *Paguma*, one of *Arctogale*, and one of *Nandinia*. In addition to these eight more "species of this group requiring further examination" are enumerated, and at least three other nominal species are mentioned. So far as I am aware only one species [1], *P. musschenbroeki*, from Celebes, has been described since Dr. Gray's Catalogue appeared; but in that Catalogue some names previously given are omitted [2], amongst which are *P. nubiæ*, F. Cuv., *P. rubidus*, Blyth, and *P. tytleri*, Tytler. As will be seen in the sequel, my own conclusions as to the species of the genus differ widely from Dr. Gray's, whose Catalogue contains numerous mistakes of various kinds [3].

[1] Except of course *P. jerdoni*, above, p. 613.

[2] A few names that have, so far as I can find, never been published are added in the synonymy. There may have been a reason, though its nature is not clear, for the insertion of these technically unborn terms, but there is no scientific purpose to be served by repeating them.

[3] I will point out two, which are characteristic, and occur in the synonymy of one species, *Paguma grayi*, P. Z. S. 1864, p. 541, and Cat. Carn. &c. Mamm. B. M. 1869, p. 73. The first is the quotation of "*Paradoxurus bondar*, Temminck, Mon. ii. p. 332, t. 55. f. 1–4 (skull, not syn.)," as a synonym of *Paguma grayi*. The late quoted, 55, is a mistake for 65, and figures 1–4 for figures 4–6, as is

J Smit del.

PARADOXURUS JERDONI

PARADOXURUS AUREUS.

Before proceeding to the synonymy of the species, a few words on the history of the genus may be useful.

That no notice of so extremely common and widely distributed an Oriental type as *Paradoxurus* should be found amongst the earlier zoological writers of the 17th and 18th centuries would be very remarkable. It is probable that some of the descriptions given by Sonnerat and others[1] were founded upon species of this genus. The first account, however, that has hitherto been recognized as

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evident from the fact that in Gray's 'List of the Specimens of Mammalia in the Collection of the British Museum,' published in 1843, the quotation runs pl. 65. f. 4–6, and these are the figures called *P. bondar* by Temminck. Gray evidently accuses Temminck in 1843, again in 1864, and once more in 1869, of having figured the skull of *P. grayi* by mistake for that of *P. bondar*. Now the two skulls differ much in form, and I can only say that Gray is entirely in error, and that Temminck appears to me quite right. It is true that on the same plate 65 of Temminck's monograph figures 1–3 represent the skull of *P. larvatus*, which is extremely similar to that of *P. grayi*; but these figures 1–3 were quoted by Gray in all the works mentioned under *Paguma larvata*, with the addition in P. Z. S. 1864, p. 540, of t. 55. f. 1–3, which, although copied without alteration in the subsequent B.M. Catalogue of 1869, is, of course, an absurd mistake, as plate 55 in Temminck's monograph contains figures of bats. The description in Temminck's work at p. 332 is also that of *P. bondar* (=*P. niger*), and not of *P. grayi*. The mistake on Gray's part is the more noteworthy, because in P. Z. S. 1864, p. 527 (and in the B.M. Catalogue of 1869), he states that some of Temminck's figures of skulls are wrongly determined, and this figure of *P. bondar* is, so far as I can see, the only case quoted.

The second instance is the quotation, also under *Paguma grayi*, of "*Amblyodon doré*, Jourdan, Ann. Sci. Nat. viii. 276 (1837)." On the next page Gray writes thus:—"The only character that M. Jourdan gives for *Amblyodon* is the following," and a quotation in French of some length follows from the 'Annales des Sciences Naturelles.' It is probable that Gray's knowledge of French did not enable him to thoroughly understand the passage, or he must have suspected a mistake, the fact being that the paper in the 'Annales des Sc. Nat.' is not by M. Jourdan at all, but is a review of M. Jourdan's paper by De Blainville, and extracted from the 'Comptes Rendus.' Had Gray turned to Jourdan's original description in the 'Comptes Rendus,' v. p. 442, he would have found a description at least as good as any of his own, and would probably not have referred the species to *P. grayi*. Judging from the description, De Blainville was perfectly right in identifying it, in his 'Ostéographie,' with *P. leucomystax*.

My reason for quoting these two mistakes is that in each case a charge is brought against another naturalist upon evidence furnished by Dr. Gray's own blunders. To correct Dr. Gray's mistakes in detail would be a Herculean labour, but unfortunately they are constantly leading others astray. Thus, in P. Z. S. 1868, p. 525, the genus *Crocuta* is said to be distinguished by having "the hinder legs short." In the 1869 Catalogue, p. 212, *Hyæna* is further characterized as having "legs subequal." Evidently the characters have been transposed, for the hind legs are much shorter in *Hyæna* than in *Crocuta*; but in a recent article on the *Viverridæ* and their allies, wherein Gray's separation of the genera *Crocuta* and *Hyæna* is noticed, one of the distinguishing characters of the former genus is said to be that the hind limbs are shorter than the fore limbs.

[1] Schreber and Gmelin, under *Viverra zeylonensis* (*V. zeylanica*), refer to *Martes philippensis*, Camelli, Phil. Trans. xxv. p. 2204, and Gray also refers to this species under *Paradoxurus zeylanicus*. Camelli merely mentioned a species of Marten, of which he gave an imperfect description, amongst the Mammalia inhabiting the Philippine Islands. The so-called Marten may, however, have been a *Paradoxurus*.

applying to a form of *Paradoxurus* is one by Buffon, who, in the Supplement to his 'Histoire Naturelle,' described an animal that he called "La Genette de France," and evidently believed to be a French species of Genet. As was, however, shown by F. Cuvier[1], the animal described and figured, which was from an unknown locality, and had been purchased in London, was probably an Indian *Paradoxurus*; but even in this case the identification is somewhat doubtful, for there were, according to Buffon, traces of annulations on the tail.

The next notices are in Schreber's 'Säugethiere,' where descriptions by Pallas are given of animals named by the latter naturalist *Viverra hermaphrodita* and *V. zeylonensis.* The following is a translation of the description in German of *V. hermaphrodita*, Schreb. Säugeth. iii. p. 426:—

"The muzzle as far as and above the eyes is black, so are also the long bristles of the beard (*Barte*, which would include the *vibrissæ*) and above the eyes, the ears, the throat throughout its whole breadth, and the feet. In front of the ears the black has a light grey margin. A white spot exists under the eye, and another amongst the vibrissæ, almost as in the Genet. The hair is long, grey near the skin, black at the tip, consequently the fur assumes a mixed, but more of a black colour. Over the back run three quite black stripes. The belly is lighter. The tail is longer than the body, black at the end. The nails are yellow.

"Over the penis there extends a longish naked spot as far as the anus. Where this spot begins, the soft white skin makes a double fold with a raised division lying between. This has occasioned the animal to be exhibited to ignorant people as a hermaphrodite."

The description leaves no reasonable doubts that the animal was a *Paradoxurus.* The size is said to have been between that of a Civet Cat and that of a Genet.

The description agrees well with the common *Paradoxurus* of the Malay countries, now generally known as *P. musanga.* The presence of the stripes on the back shows that the animal was in all probability not the Indian form (*P. niger*, v. *typus*). The Malay species has usually a broad white or whitish band across the forehead, instead of merely a "light grey margin"; but this is an extremely variable character. The specimen, it is true, was said to be from Barbary, but no North-African mammal corresponds to the description.

The *Viverra zeylonensis* of Pallas[2] has also been identified by Gray and others with a species of *Paradoxurus* found in Ceylon, but in this case the identification is very much more doubtful. The Ceylon species is of a uniform dull rufous or ferruginous colour throughout, whilst in Pallas's description the coloration was said to be grey above, overspread with brown, below paler, blackish on the hinder parts of the back and on the tail; and there is nothing by which the animal can be satisfactorily determined. The vibrissæ

[1] Hist. Nat. Mamm., notes to pl. 186, *La Martre des Palmiers* ou *Pougouné.*
[2] Schreb. Säugeth. iii. p. 451.

are said to have been whitish, which precludes the idea of the specimen having belonged to the common *P. niger*; and although it was probably a *Paradoxurus* that was described, this is far from certain, the presence of a groove beneath the penis being the only indication of generic affinities. Nothing is said of a naked area around the genitals nor of the characters of the feet. It is true that it is difficult to tell what other animal from Ceylon could have been described by Pallas, but a hundred years ago localities were by no means trustworthy, as is shown in the case of *V. hermaphrodita*.

The Musk or Musky Weasel of Pennant's 'History of Quadrupeds' (3rd edition, vol. ii. p. 72, published in 1793) has been referred to a species of *Paradoxurus* by Gray [1], and probably with justice. The description was taken from the drawing of a Bengal animal in the possession of Sir Elijah Impey.

Beyond copies and translations of Pallas's descriptions in the compilations of Zimmermann, Gmelin, Boddaert, and Shaw, I can find nothing further published on the subject until 1820 [2]. In that year Desmarest's 'Mammalogie' appeared, with descriptions of *Viverra prehensilis*, p. 208, and *V. bondar*, p. 210, founded by De Blainville on figures in the library of the East-India Company, London. The drawings are fortunately still in existence and are easily recognized; they are amongst a series made for Dr. Buchanan Hamilton by native artists, and have written on them the names *Ichneumon prehensilis* and *Ichneumon bondar*, which were apparently given by Buchanan Hamilton himself. Moreover the Bengali names are written on each drawing in the ordinary cursive Bengali character; and as this character is peculiar to Bengal, it serves to show where the drawings were made, and probably that the animals represented were well known in the country, though but little value can be attached to this evidence. I am indebted to Mr. Long for deciphering the names. The drawing of *Ichneumon bondar*, the Bengali names assigned to which are *bhám* and *bhondar*, represents the common Indian *Paradoxurus* unmistakably. This is important, as will be seen presently, because Jerdon has classed *P. bondar* as distinct. The figure of *Ichneumon prehensilis*, of which the Bengali name is given as *Bághdánkh*, represents, I believe, the striped race or species, which I refer to *P. hermaphroditus*, common in Lower Bengal and at the foot of the Himalayas. The *Paradoxurus prehensilis*, figured in the Society's 'Proceedings' for 1877, pl. lxxi., is, however, I think, a different form, *Arctogale leucotis*.

[1] P. Z. S. 1832, p. 65.

[2] Dr. Gray, in his 'Catalogue of the Carnivorous, Pachydermatous, and Edentate Mammalia in the British Museum,' p. 77, footnote, states that M. de Blainville saw the drawings collected by Buchanan Hamilton, at the India House, in 1816, and published a paper in the Bull. Soc. Philom. for that year, with descriptions of *Viverra prehensilis* and other species. There is no such paper by De Blainville in the 'Bulletin de la Société Philomathique' for 1816, nor can I find any reference to any such paper amongst the Royal Society's list of De Blainville's contributions to the periodical named and to other journals, whilst Desmarest makes no reference to a previous publication of the name.

It may be here remarked that De Blainville's name *Viverra prehensilis* cannot be applied to any species of *Paradoxurus*, because there is a much earlier use of the same term *Viverra prehensilis* by Kerr in 1792 (An. King. p. 169) for the Kinkajou (*Cercoleptes caudivolvulus*).

A third species in Desmarest's 'Mammalogie' is *Viverra nigra*, p. 208, founded upon skins sent by M. Leschenault de Latour from Pondicherry under the French name of *La Marte des palmiers* or palm-marten. Although the description was supposed by Otto to be that of *Arctictis binturong*, there can be, I think, no question but that the skin described by Desmarest was that of the common Indian *Paradoxurus*.

The generic name *Paradoxurus* was proposed in the succeeding year, 1821, by F. Cuvier in the 'Histoire Naturelle des Mammifères' for an animal living in the Menagerie at Paris, and sent by M. Lechenault[1] from Pondicherry as *La Martre des palmiers*, clearly the same species as that, a skin of which in the previous year had formed the type of Desmarest's *Viverra nigra*. Cuvier proposed a new specific title, *Paradoxurus typus*, for his animal; and as the name was accompanied by a coloured figure, which, although far from a good representation, is fairly recognizable, this name has been more generally used than any of the earlier specific titles. The generic name was founded on the circumstance of the animal carrying its long tail in a coil, a peculiarity that appears to be very common in caged specimens belonging to this genus, but which has never, so far as I can learn, been observed in the wild state. That the coiling is due to a diseased condition is evident from the circumstance that many animals thus affected are unable to uncoil their tails.

In the 'Mémoires du Muséum d'Histoire Naturelle,' vol. ix. p. 41 (1822), F. Cuvier added two additional species, *P. albifrons* and *P. aureus*. The former, from a drawing by Duvaucel of an animal in the Menagerie at Barrackpoor Park, near Calcutta, was not a *Paradoxurus* at all, but *Arctictis binturong*; the latter was taken from a young animal, preserved in spirit, of unknown origin. As it was coloured of a golden tawny (fauve doré) throughout, the only species to which it can be referred is the Ceylonese animal subsequently called *P. zeylanicus* by Gray.

Long subsequently, in 1839, F. Cuvier, the younger, figured and described in one of the numbers of the 'Histoire Naturelle des Mammifères' a specimen said to have been brought from Nubia by a Mr. Burton, under the name of *Paradoxurus nubiæ*. The figure may have been taken from a typical variety of *P. hermaphroditus*.

Viverra musanga was described by Raffles in 1822, and subsequently referred to *Paradoxurus* in Horsfield's 'Zoological Researches in Java.' Another species, *P. leucopus*, was added by Ogilby, in the 'Zoological Journal' of 1828, vol. iv. p. 304. *Gulo larvatus*, described originally by Hamilton Smith, was made the type of a new genus, *Paguma*, by Gray, in the Society's 'Proceedings,' Part 1

[1] Doubtless the same as is mentioned by Desmarest, though his name is spelt with a slight difference

(1831), and referred by him to *Paradoxurus* in the next volume of the same work.

In the Society's 'Proceedings' for 1832, pp. 65–68, Dr. Gray gave a list[1] of the known species of *Paradoxurus*, and proposed as new *P. pennantii*, *P. dubius*, *P. pallasii*, *P. crossii*, *P. hamiltonii*, *P. trivirgatus*, and *P. finlaysonii*, besides enumerating *P. typus*, *P. bondar*, *P. prehensilis*, *P. musanga*, *P. hermaphroditus*, *P. leucopus*, *P. larvatus*, and *P. binotatus* previously described. He was also inclined to refer to the genus *Viverra malaccensis* of Gmelin (which, however, is a *Viverricula*) and *Paradoxurus aureus* of F. Cuvier.

In Gray and Hardwicke's 'Illustrations of Indian Zoology,' *P. crossii*, *P. pallasii*, *P. prehensilis*, *P. hamiltonii*, *P. larvatus*, *P. bondar*, and *P. pennantii* are figured. The figures are not good, and some of them are very inferior, *P. prehensilis*, *P. bondar*, and *P. pennantii* being founded on drawings alone, as was also *P. finlaysonii*.

In 1837 Gray described six more supposed species of the genus—*P. quinquelineatus*, *P. leucomystax*, *P. musangoides*, *P. derbyanus*, *P. zebra*, and *P. jourdanii*—in Charlesworth's 'Magazine of Natural History,' vol. i. Another name, *P. nigrifrons*, was added by the same author in the 'List of the Specimens of Mammalia in the Collection of the British Museum,' published in 1843.

Otto, in the 'Nova Acta Academiæ Leop.-Car.' for 1835, gave an excellent description and good figures of an animal which he recognized as the *Viverra hermaphrodita* of Pallas, but which he did not identify with Cuvier's genus *Paradoxurus*. He gave an account with illustrations of the genital glands, and proposed a new generic name *Platyschista* and the specific term *pallasii*.

In the same year *Paradoxurus grayi* was described by Bennett in the Proceedings of this Society. In 1836 Hodgson added three more names, *P. hirsutus*, *P. nipalensis*, and *P. lanigerus* (subsequently corrected to *laniger*), in the 'Asiatic Researches,' vol. xix.

In 1837 Jourdan in the 'Comptes Rendus' proposed two new genera under the names of *Hemigalus* (*Hemigale* is preferable) and *Ambliodon* (*Amblyodon*). No Latin specific names were given; the animals were called *Hemigale zébré* and *Ambliodon doré*. An essay by De Blainville on these two forms appeared in the 'Comptes Rendus,' and was copied into the Ann. Sci. Nat. 2me sér. viii. p. 270, and in the table at the end he united *Ambliodon* and *Paradoxurus*, whilst leaving *Hemigale* as a distinct section; both being considered subgenera or sections of *Viverra*. In a subsequent page of the same volume of the 'Comptes Rendus,' Mr. Jourdan briefly described a species of *Paradoxurus* from the Philippines, under the name of *P. philippinensis*. This paper was reviewed by F. Cuvier in the 'Annales des Sciences Naturelles.'

About 1839 there appeared a monograph of the genus by Temminck, in the 'Monographies de Mammalogie,' vol. ii. Temminck admitted seven species, viz. *P. typus*, *P. musanga*, *P. leucomystax*,

[1] This paper was reprinted in the 'Journal of the Asiatic Society of Bengal,' vol. ii. p. 377.

P. larvatus, *P. bondar*, *P. trivirgatus*, and *P. binotatus*, and classed as doubtful *P. leucopus*, *P. philippensis*, and *P. prehensilis*. This monograph is by far the best attempt at reducing to order a very difficult and complicated genus that has appeared. Gray speaks of it (P. Z. S. 1864, pp. 527, 534) in severe terms; and there are undoubtedly some mistakes, several of which appear due to information given by Mr. Ogilby having been incorrect or misunderstood. I can only say that Temminck's work appears to me superior in every respect to Dr. Gray's, and that out of the species admitted by the former I find only one, *P. bondar*, that does not appear a fairly distinct form. Temminck considers *P. pallasii*, *P. crossii*, *P. dubius*, and *P. hermaphroditus* of Gray identical with *P. musanga*, *P. pennantii* the same as *P. bondar*, and *P. hamiltonii* identical with *P. binotata*. In all this I agree; but the union of *P. grayi* and *P. laniger* with *P. larvatus*, which Temminck gives on the authority of Ogilby, is not admissible so far as the present evidence goes, although *P. grayi* and *P. larvatus* appear closely allied. *P. laniger* seems totally distinct[1].

Temminck also looked upon the *Ambliodon doré* and the *Paradoxurus philippinensis* of Jourdan as the same. This was, I think, a mistake.

In De Blainville's 'Ostéographie,' under *Viverra*, an account of the osteology of *Paradoxurus typus* (*P. niger*) is given; and in the Atlas two skulls belonging to the restricted genus are figured—one called *P. hermaphroditus* in the text and *P. typus* in the Atlas (probably that of *P. niger*); the other called *P. auratus* and apparently that of Jourdan's *Ambliodon doré*, which in the text is recognized as identical with *P. leucomystax*.

Wagner's Supplement to Schreber's Säugethiere, vol. ii., published in 1841, contains descriptions of the following species considered distinct:—*P. leucopus*, *P. grayi*, *P. nipalensis*, *P. typus*, *P. musanga*, *P. trivirgatus*, *P. leucomystax*, *P. hirsutus*, *P. felinus*, *P. larvatus*, *P. laniger*, *P. annulatus*, and *P. hamiltoni*. Besides these, *P. crossi*, *P. prehensilis*, *P. quinquelineatus*, *P. jourdanii*, *P. derbyanus*, *P. zebra*, and *P. philippensis* are enumerated as imperfectly known. *P. annulatus* is a supposed new species, founded on a young individual with a ringed tail (probably a variety of *Nandinia binotata*) in the Munich Museum, and *P. felinus* is proposed as a preferable name for *P. hermaphroditus*. Wagner's arrangement of the species appears on the whole inferior to Temminck's.

In Schinz's 'Synopsis Mammalium,' vol. i., published in 1844, *P. typus*, *P. musanga*, *P. leucomystax*, *P. larvatus*, *P. bondar*, *P. trivirgatus*, *P. binotatus*, *P. annulatus*, *P. leucopus*, *P. philippensis*, and *P. nipalensis* are included in the genus; and in the Supplement to the second volume *P. quinquelineatus*, *P. musangoides*, and *P. nubiæ* are added.

A few other species have been described in various works. Amongst

[1] I found some peculiarly coloured specimens of *P. grayi* in the British-Museum collection labelled *P. laniger*. It is possible that Ogilby may have seen these, and have thus been induced to confound the two species.

these were *P. ogilbyi*, locality unknown, in 1849 by Fraser, in his 'Zoologia Typica'; *P. setosus*, from Ceram, by Hombron and Jacquinot, in the 'Voyage au Pôle Sud'; *P. crassiceps*, by Pucheran in 1855; *P. montanus*, Kelaart, by Blyth, in 1851; *P. rubidus*, by Blyth, in 1858; and *P. strictus* and *P. quadriscriptus*, by Hodgson, in 1855.

In Horsfield's 'Catalogue of the Mammalia in the Museum of the East-India Company,' published in 1851, the following species were enumerated:—*Paradoxurus typus*, *P. musanga*, *P. prehensilis*, *P. trivirgatus*, *P. pallasii*, *P. finlaysonii*, *P. leucotis*, *Paguma grayi*, and *P. bondar*. Of these *P. leucotis*, Blyth, was new.

Temminck, in his 'Esquisses Zoologiques sur la Côte de Guinée,' which appeared in 1853, gave a fresh list of the species comprised in this genus. In this list two additional names were added to those previously enumerated as valid in his monograph; these were *P. ogilbyi* and *P. stigmaticus*, the latter described from Borneo in the 'Esquisses.'

Giebel's 'Säugethiere' (1859) contained accounts of nine specific forms: *P. leucopus*, *P. larvatus*, *P. philippensis*, *P. leucomystax*, *P. bondar*, *P. typus*, *P. musanga*, *P. trivirgatus*, and *P. binotatus*. Some caustic remarks, not more severe than the occasion demanded, were added upon the mere nominal species invented by Dr. Gray and others.

In Gray's Monographs of 1864 (P. Z. S.) and 1869 (Cat. Carn. &c. Mamm. B.M.) two additional names are introduced: *P. fasciatus* instead of *P. musanga*, founded, but erroneously, as shown by Alston[1], on Desmarest's *Viverra fasciata*, and *P. macrodus*. *P. fuscus* of Kelaart is also mentioned under *P. zeylanicus*, but no such specific name was used by Kelaart, who only called the form *P. zeylanicus* var. *fuscus*. Some other MS. names are enumerated as synonyms; the only one of any importance is *P. leucocephalus*, Gray, 'Voy. Samarang,' quoted under *P. leucomystax*. I cannot find any notice of the species in the work named.

Blyth's 'Catalogue of the Mammalia in the Museum Asiatic Society' (Calcutta, 1863), contained the following names, with synonymy, of species represented in the collection:—*P. musanga* (inclusive of *P. typus*), *P. zeylanicus*, *P. trivirgatus*, *P. leucotis*, *P. laniger* (?), *P. leucomystax*, *P. grayi*, and *P. rubidus*. In Jerdon's 'Mammals of India' (1867), the only species described are *P. musanga*, *P. grayi*, and *P. bondar*, but Cingalese, Assamese, and Burmese forms are omitted. From Burma Blyth, in the List of Mammals published in 1875, records *P. grayi*, *P. musanga*, *P. trivirgatus*, and *P. leucotis*. The only species included in Mr. Swinhoe's list of the mammals of Southern China (P. Z. S. 1870, p. 630) is *P. larvatus*.

Adding to the above list the few names recently given, we have thus a grand total of no less than forty-nine specific terms given by

[1] P. Z. S. 1879, p. 666.

various writers to forms that are, or have been, recognized as belonging to the genus *Paradoxurus*. Of these no less than sixteen have been invented by Dr. J. E. Gray, and five by Mr. B. H. Hodgson. A considerable proportion of the nominal species have been made upon drawings (some of them very bad, to judge by the copies published) and immature specimens, and it is not always possible to identify such names satisfactorily.

A few of the names enumerated, however, are no longer included in the genus *Paradoxurus*. Besides such instances as *P. albifrons*, of F. Cuvier, a synonym of *Arctictis binturong*, several species formerly included in *Paradoxurus* are now separated by most naturalists. To *Hemigale* (variously spelt *Hemigalus* and *Hemigalea*) belong *P. derbianus*, Gray, and *P. zebra*, Gray, both of which names appear to have been given to the same species, now known by an older specific name, *H. hardwickii*, also bestowed by Dr. Gray. Similarly, *P. binotatus* and *P. hamiltonii*, two more of Dr. Gray's names, are now recognized as identical, and are distinguished as *Nandinia*, the African representative of the Oriental *Paradoxuri*. A third generic type, *Arctogale*, has, like the preceding, been admitted by Flower[1] and Mivart[2]; and although it is more nearly allied than the other two genera just mentioned to true *Paradoxurus*, the much smaller teeth, the very narrow and peculiarly formed mesopterygoid fossa, and, apparently, the absence of any conspicuous naked space corresponding to the genital glandular area[3], show an amount of distinction that may perhaps be accepted as generic. It is true that as regards the teeth and the characters of the mesopterygoid fossa, a decided approach to *Arctogale* is made by the group of *Paradoxuri* distinguished by Gray as *Paguma*[4], and by Jourdan as *Amblyodon*; but the difference from typical *Paradoxurus* is much smaller. I do not think the matter of much importance; and as the genus *Paradoxurus*, when the nominal species are weeded out, is not so large as to require division, and as all the species are similar in external appearance and habits, it appears to me better to retain this generic group to the extent generally admitted by the naturalists of the present day.

The genus *Arctogale* was proposed in MS. by Peters, and adopted and published by Gray[5]. The type is said to be *Paradoxurus trivirgatus*; but after examining the type of that species, which is in the Leyden Museum, I am disposed to believe that two forms have been confounded under that name. Unfortunately I omitted, when on a visit to Berlin recently, to examine Peters's type; but the specimens described as *A. trivirgata* by Gray in the 'Proceedings' of the Society for 1864, and again in the 'Catalogue of Carnivorous

[1] 'Encyclopædia Britannica,' vol. xv., Art. Mammalia, p. 436.

[2] P. Z. S. 1882, pp. 163, 169.

[3] This was noticed by Dr. Gray, P. Z. S. 1864, p. 543.

[4] Proposed P. Z. S. 1831, p. 95, for *P. larvata*. The description related chiefly to the dentition. Subsequently, P. Z. S. 1832, p. 65, Dr. Gray stated that this genus was first established on an animal that had not completely shed its milk-teeth, although its true molars were partly developed.

[5] P. Z. S. 1864, p. 542.

&c. Mammalia,' published in 1869, appear to me to belong to *Paradoxurus stigmaticus* of Temminck; and this I am inclined to agree with Dr. Jentink[1] in considering distinct from the original *Viverra trivirgata* of Reinwardt, and consequently from Dr. Gray's *Paradoxurus trivirgatus*[2] founded on Reinwardt's specimen. The skulls of the two[3] differ considerably, that of *P. stigmaticus* being much longer in proportion, with the palate further produced backwards, and much narrower behind the postorbital processes. Some other differences have been pointed out by Dr. Jentink.

But amongst the skins in the British Museum is the type of *Paradoxurus leucotis*, Blyth, originally described by Horsfield[4], and subsequently by Blyth[5], whose descriptions agree perfectly well. This skin appears to me to be a pale variety of Temminck's *P. stigmaticus*, and, if so, Blyth's name, which has priority by two years, must be retained for the species.

The skull and mandible figured by Dr. Mivart (P. Z. S. 1882, p. 165, fig. 9) are those of *Arctogale leucotis*[6]. The following is the principal synonymy of the two forms referred to *Arctogale*:—

1. Arctogale trivirgata.

Viverra trivirgata, Reinw. MS.

Paradoxurus trivirgatus, Gray, P. Z. S. 1832, p. 68; Temm. Mon. Mam. ii. p. 333, pl. 63. f. 1; Müller, Zoogd. Ind. Arch. p. 55; Wagner, Schreb. Säugeth. ii. p. 346, *partim*; Schinz, Syn. Mamm. i. p. 385, *partim*; Horsfield, Cat. Mam. Mus. E. I. Co. p. 64, *partim*; Giebel, Säugeth. p. 801, *partim*; Jentink, Notes Leyd. Mus. vii. p. 35.

Length of skull from occipital condyles to alveolar margin of premaxillary bones 3·8 inches, palate length 2·1, breadth at junction of upper sectorials with first true molars 1, breadth of brain-case behind postorbital processes 0·75.

Hab. Java only.

2. Arctogale leucotis.

Paradoxurus leucotis, Blyth, Horsfield, Cat. Mus. E. I. Co. p. 66 (1851); id. J. A. S. B. xxvii. p. 274; id. Cat. Mamm. Mus. A. S. p. 48; id. Cat. Mam. Birds Burma, p. 26; Gray, P. Z. S. 1864, p. 544; id. Cat. Carn. &c. Mamm. B. M. 1869, p. 76.

Paradoxurus stigmaticus, Temm. Esquisses Zool. p. 121 (1853);

[1] Notes Leyd. Mus. vii. p. 35. [2] P. Z. S. 1832, p. 68.

[3] It should, however, be stated that in neither of the actual type specimens is the skull preserved.

[4] Cat. Mamm. Mus. E. I. Co. p. 66. [5] J. A. S. B. xxvii. p. 274.

[6] The woodcut of *Arctogale*, P. Z. S. 1882, p. 164, f. 8, is not a good representation of the animal. The feet are much too heavy, the head too large, and the coloration at all events not typical. A far better figure will be found in the coloured plate, P. Z. S. 1877, p. 681, pl. lxxi., entitled *Paradoxurus prehensilis*. This appears to me to represent *P. leucotis* of Blyth, the light-coloured variety of *A. stigmatica*. The skin and skull of the animal there figured are now, I believe, in the British Museum, where I have examined them.

Gray, P. Z. S. 1864, p. 543; id. Cat. Carn. &c. Mam. B. M. 1869, p. 76; Jentink, Notes Leyd. Mus. vii. p. 35.

Paguma trivirgata, Gray, List Sp. Mam. B. M. 1843, p. 55; Cantor, J. A. S. B. xv. p. 201 (nec *Viverra trivirgata*, Reinw.).

Paradoxurus trivirgatus, Horsf. Cat. Mam. Mus. E. I. Co. p. 64, *partim*; Blyth, Cat. Mam. Mus. A. S. p. 47; id. Cat. Mam. Birds Burma, p. 26 (nec *P. trivirgatus*, Gray, 1832).

Arctogale trivirgata, Gray, P. Z. S. 1864, p. 543; id. Cat. Carn. &c. Mam. B. M. 1869, p. 75; Mivart, P. Z. S. 1882, p. 163, figs. 8 and 9.

Paradoxurus prehensilis, Sclater, P. Z. S. 1877, p. 681, pl. lxxi. (nec *Viverra prehensilis*, Blainv.).

Length of skull 4·15 inches, zygomatic breadth 2·4, palate, length 2·3, breadth 1, breadth of brain-case behind postorbital processes 0·5.

Hab. The Malay peninsula and Burma, as far north as Arakan; Sumatra, and Borneo.

There is in the British-Museum collection a Bornean skull that appears to differ sufficiently from those of both *A. trivirgata* and *A. leucotis* to render the existence of a third species probable.

After deducting the specific names above mentioned and restricting the genus, there remain, so far as I am aware, *forty* specific names to be assigned to the different distinguishable forms recognizable as pertaining to *Paradoxurus*. These forms appear to me to be eleven in number, but as there are several described types I have not been able to compare, I may have to correct this estimate. I have, however, been able to examine the majority of the types named by Dr. Gray, and all of Mr. Hodgson's.

Of these eleven specific forms two are very imperfectly known—one, *P. laniger*, being founded upon a skin only, the other, *P. macrodus*, upon a skull alone; but both these appear perfectly distinct from all others. Of the remaining nine, three, viz. *P. larvatus*, *P. grayi*, and *P. leucomystax*, form a very natural group, the genus *Paguma* of Gray[1], distinguished by the characters of the skull, the most important of which is the much greater production of the bony palate. The teeth, too, are somewhat smaller, the brain-case much less constricted behind the postorbital processes, and the frontal region more rounded.

P. musschenbroeki differs greatly from all other species in its annulated tail. The skull is intermediate in form between the last-mentioned little group (*Paguma*) and typical *Paradoxuri*, but rather nearer to the former. The shape of the palate is peculiar.

The remaining five species are very closely allied, and *P. macrodus*, so far as cranial characters go, is connected with them. Three of these forms, *P. niger*, *P. hermaphroditus*, and *P. philippensis*, are so nearly related, and have such distinctly intermediate links, that it is a question whether they should be considered species or geographical races. The other two are well distinguished by external or

[1] In his latest writings at least; formerly he included other species.

cranial characters. The following is a key to the species here admitted [1]:—

A. The tail considerably more than half the length of the head and body together (usually three quarters or more); teeth of moderate size.
- *a*. Tail not ringed.
  - *a*. The bony palate extends less than $\frac{1}{4}$ inch behind the posterior molars. Vibrissæ in general dark-coloured.
    - *a'*. Colour fulvous, ashy, or black.
      - *a''*. Back unstriped, no pale band across forehead; inner or proximal side of upper sectorial concave .... 1. *P. niger.*
      - *b''*. Back generally striped, a pale band across forehead; inner side of upper sectorial straight .... 2. *P. hermaphroditus.*
    - *b'*. Colour dark brown.
      - *a''*. Fur glossy with black tips. Anterior palatine foramina only extending back as far as canines .... 3. *P. philippinensis.*
      - *b''*. Fur grizzled, not glossy, with brown tips. Anterior palatine foramina extending to opposite anterior premolars .... 5. *P. jerdoni.*
    - *c'*. Colour dull rusty red throughout .... 6. *P. aureus.*
  - *b*. The bony palate extends more than $\frac{1}{4}$ inch behind the posterior molars. Vibrissæ, in part at least, conspicuously white.
    - *a'*. Colour grey or fulvous, head markings indistinct. Skull $4\frac{1}{2}$ to $4\frac{3}{4}$ inches long ... 7. *P. grayi.*
    - *b'*. Colour generally greyish brown; head-markings black and white, distinct; a broad white band down the forehead and nose. Skull about 4 inches long .... 8. *P. larvatus.*
    - *c'*. Colour brown or rufous; head-markings generally distinct, brown and whitish; a broad pale band across forehead, or whole face whitish. Skull about 5 inches long ... 9. *P. leucomystax.*
- *β*. Tail ringed.
  - *a*. Colour above brownish red, with white hairs intermixed .... 10. *P. musschenbroeki.*

B. Teeth very large.
- *a*. Only skull known; upper sectorial 0·42 inch long 4. *P. macrodus.*

C. Tail about half the length of the head and body. Skull not known .... 11. *P. laniger.*

Of the species belonging to allied genera, *Hemigale hardwickii* has broad transverse coloured bands on the back. *Nandinia binotata* may be recognized by its back and sides being spotted with large dark spots, by a pale spot on each side of the withers, and a subannulate tail; *Arctogale trivirgata* and *A. leucotis* by having three

[1] This key will, in most cases, serve to identify specimens of *Paradoxurus*, but, I fear, not always by means of the external characters. I have, since this paper was in type seen three specimens of *P. hermaphroditus*, obtained by Dr. J. Anderson in the Mergui Archipelago, Tenasserim. One of these is uniformly dark brown, almost black, and resembles in colour some forms of *Arctogale leucotis*, having none of the markings of *P. hermaphroditus*. The other two are dark brown, with the vibrissæ in part white, and are externally only distinguishable by size from *P. leucomystax*. The skull, however, in each case is unmistakably that of *P. hermaphroditus*.

dark stripes on the back (these are in a very few cases wanting), and by the black or ashy colour of the head unbroken, except sometimes in the latter by a small white spot on the forehead or a narrow white streak down the nose. The small teeth and apparently the absence of a naked space around the preanal glands are also characteristic of the latter genus.

1. Paradoxurus niger.

Musk or *Musky Weasel*, Pennant, Hist. Quad. ed. 3, ii. p. 72(1793).

Viverra nigra, Desm. Mam. p. 208 (1820).

V. bondar, de Blainv., Desm. ib. p. 210.

Martre des palmiers ou *pougouné* (*Paradoxurus typus*), F Cuv. Hist. Nat. Mam. pl. 186 (1821); Desm. Mam. Supp. p. 540.

Paradoxurus leucopus, Ogilby, Zool. Journ. iv. p. 304 (1828); Gray, P. Z. S. 1832, p. 67; Temm. Mon. Mam. ii. p. 338; Wagner, Schreb. Säugeth. Suppl. ii. p. 339; Schinz, Syn. Mam. i. p. 386; Giebel, Säugeth. p. 798.

P. typus, Fischer, Syn. Mam. p. 158 (1829); Sykes, P. Z. S. 1831, p. 102; Gray, P. Z. S. 1832, p. 65; List Sp. Mam. B. M. 1843, p. 56; Temm. Mon. Mam. ii. p. 315; Elliot, Madr. Jour. Lit. Sci. x. p. 103 (1839); Wagner, Schreb. Säugeth. Supp. ii. p. 342 (1841); Schinz, Syn. Mamm. i. p. 381; Horsfield, Cat. Mam. Mus. E. I. C. p. 60 (1851); De Blainv. Ostéographie, *Viverra*, p. 17, Atlas, pl. vii.; Kelaart, Prodr. Faun. Zeyl. p. 38 (1852); Giebel, Säugeth. p. 800 (1859).

? *P. pennantii*, Gray, P. Z. S. 1832, p. 66; Illustr. Ind. Zool. ii. pl. 13.

P. bondar, Gray, P. Z. S. 1832, p. 66; Illustr. Ind. Zool. ii. pl. 12; List Sp. Mam. B. M. 1843, p. 56; Cat. Hodgson's Coll. B. M. p. 10 (1846); id. ibid. ed. 2, p. 5 (1863); P. Z. S. 1864, p. 531; Cat. Carn. &c. Mam. B. M. 1869, p. 63; Temm. Mon. Mam. ii. p. 332, pl. 65. f. 4, 5, 6; Schinz, Syn. Mam. i. p. 384; Giebel, Säugeth. p. 799; Jerdon, Mam. Ind. p. 128.

Platyschista pallasii, Otto, Nov. Act. Leop.-Car. xvii. p. 1089, pls. lxxii., lxxiii. (1835).

Paradoxurus hirsutus, Hodgs. As. Res. xix. p. 72 (1836); J. A. S. B. x. p. 909; Calc. Journ. N. H. iv. p. 287; Wagner, Schreb. Säugeth. Supp. ii. p. 348.

Paguma bondar, Horsf. Cat. Mam. Mus. E. I. C. p. 68 (1851).

Viverra (*Paradox.*) *hermaphrodita*, De Blainv. Ostéographie, *Viverra*, p. 96 (nec Pallas).

P. hermaphroditus, Gray, P. Z. S. 1864, p. 532; Cat. Carn. &c. Mam. B. M. 1869, p. 65 (nec *Viverra hermaphrodita*, Pallas).

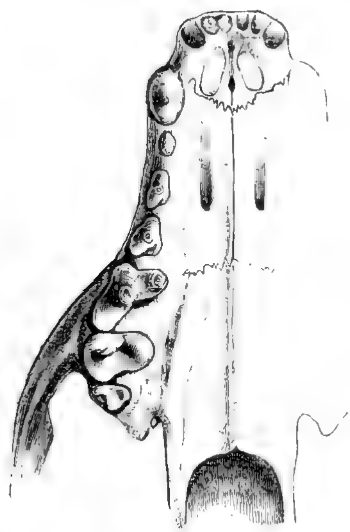
P. musanga, Blyth, Cat. Mam. Mus. A. S. p. 46, *partim*; Jerdon, Mam. Ind. p. 125, *partim*, nec *V. musanga*, Raffles.

Tail nearly or quite as long as the head and body. Fur coarse and often long, some piles, especially on the back, long and ragged; underfur short or wanting.

In the skull the bony palate extends but little (not more usually than about one eighth of an inch) behind a line drawn through the hinder edge of the posterior molars. Muzzle generally produced and narrow, but varying in length. Upper sectorial tooth narrow, the inner lobe small and at the distal extremity of the tooth, so that the greatest breadth, at right angles to the outer margin, is at that extremity. This breadth is about two thirds the length of the tooth measured along the outer margin. The inner margin of the tooth between the inner and hinder lobe distinctly concave.

Colour blackish grey to brownish grey. The fur in general long, and with long ragged coarse black tips, but these are naturally much more developed in the cold season. Underfur, when present, ashy

Fig. 1.



Half palate and dentition of *P. niger*. (Specimen no. Brit. Mus. 46.11.9.9.)

or brownish; the longer hairs, beyond the underfur, pale grey with long black tips. As a rule there are no stripes on the back, but indistinct dark bands and rows of spots are sometimes found, especially in young specimens. Feet and the greater part of the legs, with the terminal portion of the tail, frequently one half or more, quite black. The tip of the tail in some individuals is white. The head-markings are variable, the face is generally black or blackish, with a distinct white or grey spot below each eye; another, generally to be detected, on each side of the nose, amongst the vibrissæ, and very often another above the eye. There is not, however, in this form, as usually in the next, a distinct whitish band across the forehead. Vibrissæ black; occasionally, but rarely, a few of the lower are whitish or white towards the base.

Dimensions. Head and body of a male $22\frac{1}{2}$ inches long, tail $19\frac{1}{2}$; of a female $17\frac{7}{10}$ and 18 (*Elliot*). Hodgson gives similar measurements, except that in the female the head and body measured 20, tail $17\frac{1}{2}$. The skull is about $4\frac{1}{4}$ to $4\frac{1}{2}$ inches long.

Distribution. This form of *Paradoxurus* is peculiar to the peninsula of India and Ceylon. It ranges through all those parts of India that are well wooded, and is found equally about human habitations and in wild forest.

The question of nomenclature and the distinction between this and the next species will be discussed under the latter.

Synonymy. The origin of the names *Viverra nigra*, *V. bondar*, and *Paradoxurus typus* has already been mentioned. *P. leucopus* of Ogilby has been classed as distinct by several writers; and by Gray (P. Z. S. 1864, p. 542) it is said to be probably a variety of *P. grayi*. The vibrissæ are, however, described as black, whilst in *P. grayi* they are always white. The species was of peculiar coloration, with a band round the loins, the feet, and the tip of the tail pure white. But pied or piebald specimens are not of infrequent occurrence in the present species: they are mentioned by Blyth, Jerdon, and Tickell, and as the remainder of Ogilby's description, and especially the presence of long coarse hairs tipped with black on the head, neck, shoulders, rump, and tail, agree with *P. niger*, there can be no hesitation in classing *P. leucopus* as a partially albino individual of that species.

P. pennantii was named from a drawing in General Hardwicke's collection, said to have been taken from an animal found in the Upper Provinces of Bengal, where *P. niger* is the only species found.

The figure of *Platyschista pallasii* resembles *P. niger* in coloration and in the want of any distinct pale frontal band. The back was said to be banded, but the banding represented in the figure is very ill-marked and indefinite.

The identity of Hodgson's *P. hirsutus* with *P. bondar* has been generally accepted. The only difference between the northern race (*P. bondar* v. *hirsutus*) and the southern (*P. niger* v. *typus*=*hermaphroditus* apud Gray), so far as I can see, is that the latter is more ashy and blacker, the former browner in colour. The reason why Blyth and Jerdon, to whose opinions I should attach great weight, have classed *P. bondar* as distinct whilst uniting *P. niger* and *P. hermaphroditus*, was, I believe, that neither of these naturalists had ever seen any of the specimens called *P. bondar* or *P. hirsutus* by Gray, Hodgson, and others. Jerdon's description of *P. bondar* is evidently copied from Hodgson's account of *P. hirsutus*.

2. PARADOXURUS HERMAPHRODITUS.

? *La Genette de France*, Buff. Hist. Nat. Supp. iii. p. 237, pl. 47 (1776).

Viverra hermaphrodita, Pall. Schreb. Säugeth. iii. p. 426 (1778); Zimm. Geol. Gesch. ii. p. 285; Bodd. Elench. An. p. 82; Gmel. Syst. Nat. i. p. 90; Shaw, Gen. Zool. i. pt. 2, p. 400.

V. prehensilis, Blainv., Desm. Mam. p. 208 (1820); nec *V. prehensilis*, Kerr, An. King. p. 169 (1792).

V. musanga, Raffles, Trans. Linn. Soc. xiii. p. 252 (1820); Desm. Mam. Suppl. p. 539.

V. musanga, var. *javanica*, Horsfield, Zool. Res. Java, pl. (1824).

Paradoxurus typus, β. *sumatranus*, Fischer, Syn. Mam. p. 159 (1829).

Paradoxurus prehensilis, Gray, P. Z. S. 1832, p. 66; Ill. Ind. Zool. ii. pl. 9; Bennett, P. Z. S. 1834, p. 33; Temm. Mon. Mam. ii. p. 340; Wagner, Schreb. Säugeth. ii. p. 354; Horsf. Cat. Mam. Mus. E. I. C. p. 63; Gray, P. Z. S. 1864, p. 545; Cat. Carn. &c. Mam. B. M. 1869, p. 77.

P. musanga, Gray, P. Z. S. 1832, p. 66; List Sp. Mam. B. M. 1843, p. 56; Cantor, J. A. S. B. xv. p. 201; Temm. Mon. Mam. ii. p. 317, pl. 64, f. 1–3; Müller, Zoogd. Ind. Arch. p. 54; Wagner, Schreb. Säugeth. Supp. ii. p. 344; Schinz. Syn. Mam. i. p. 382 (1844); Horsf. Cat. Mam. Mus. E. I. C. p. 62 (1851); Giebel, Säugeth. p. 800; Blyth, Cat. Mam. Mus. A. S. p. 46, *partim*; Cat. Mam. Birds Burma, p. 26; Jerdon, Mam. Ind. p. 125, *partim*.

P. dubius, Gray, P. Z. S. 1832, p. 66; List Sp. Mam. B. M. 1843, p. 56; P. Z. S. 1864, p. 537; Cat. Carn. &c. Mam. B. M. 1869, p. 69.

Paradoxurus hermaphroditus, Gray, P. Z. S. 1832, p. 67; 1858, p. 113.

P. pallasii, Gray, P. Z. S. 1832, p. 67; Illustrations Ind. Zool. ii. pl. 8; List Sp. Mam. B. M. 1843, p. 55; P. Z. S. 1861, p. 136; Horsf. Cat. Mam. Mus. E. I. C. p. 65 (1851).

P. crossii, Gray, P. Z. S. 1832, p. 67; Illust. Ind. Zool. ii. pl. 7; Wagner, Schreb. Säugeth. Supp. ii. p. 354; P. Z. S. 1864, p. 533, with figure of skull; Cat. Carn. &c. Mam. 1869, p. 66.

P. finlaysonii, Gray, P. Z. S. 1832, p. 68, 1864, p. 545; Horsf. Cat. Mam. Mus. E. I. C. p. 65 (1851).

P. quinquelineatus, Gray, Charlesworth's Mag. Nat. Hist. i. p. 579 (1837); Wagner, Schreb. Säugeth. Supp. ii. p. 355; Schinz, Syn. Mam. ii. Supp. p. 40; P. Z. S. 1864, p. 537; Cat. Carn. &c. Mam. B. M. 1869, p. 69.

P. musangoides, Gray, ibidem, Schinz, ib.

? *P. nubiæ*, F. Cuv. fil. Hist. Nat. des Mam. pl. 187 (1839); Schinz, Supp. p. 41.

Paradoxurus felinus, Wagner, Schreb. Säugeth. Supp. ii. p. 349 (1841).

Paguma crossii, Gray, List Sp. Mam. B. M. 1843, p. 54.

Paradoxurus nigrifrons, Gray, List Sp. Mam. B. M. 1843, p. 55 (*nomen nudum*); P. Z. S. 1864, p. 535; Cat. Carn. &c. Mam. B. M. 1869, p. 68.

P. setosus, Hombr. & Jacq. Voy. au Pôle Sud, Zool. iii. p. 25, Atlas, pl. 6.

P. strictus, Hodgs. Ann. Mag. N. H. ser. 2, xvi. p. 105; P. Z. S. 1856, p. 396, pl. xlvii.; Gray, P. Z. S. 1864, p. 544; Cat. Carn. &c. Mam. B. M. 1869, p. 76.

P. quadriscriptus, Hodgs. Ann. Mag. N. H. ser. 2, xvi. p. 106; P. Z. S. 1856, p. 396, pl. xlviii.; Gray, P. Z. S. 1853, p. 191; 1864, p. 544; Cat. Hodgson's Coll. B. M. 2nd ed. 1863, p. 5; Cat. Carn. &c. Mam. B. M. p. 76.

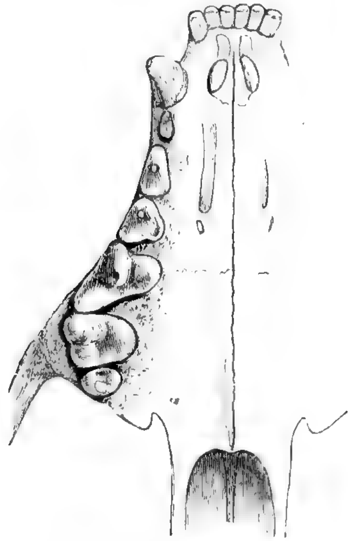
? *P. crassiceps*, Pucheran, Rev. et Mag. Zool. vii. p. 393 (1855).

P. fasciatus, Gray, P. Z. S. 1864, p. 556; Cat. Carn. &c. Mam. B. M. 1869, p. 68, nec *Viverra fasciata*, Desm.

Tail more than three quarters the length of the head and body, sometimes quite as long or a little longer. Fur of moderate length in general, not so long and ragged as in *P. niger*.

In the skull the bony palate not produced behind. Muzzle decidedly shorter than it usually is in *P. niger*, and zygomatic arches as a rule stronger. Upper sectorial and molars larger, the former with a much larger internal lobe, and with the inner margin (from the inner to the hinder lobe) nearly or quite straight.

Fig. 2.



Half palate and dentition of *P. hermaphroditus*. (Spec. no. B.M. 81.12.2.3.)

Colour brownish grey, occasionally ashy. Underfur, when present, brownish, the longer hairs light brown or grey, with occasionally black tips, but these are not as a rule greatly developed, though some Bornean specimens have long sooty-brown terminations. The back is generally more or less distinctly striped with black longitudinally, the number of stripes varying, and the lateral bands being often replaced by rows of spots. The feet, the greater part of the legs, and the terminal portion of the tail black, the tip of the latter occasionally white. Usually there is a distinct broad whitish or grey band across the forehead and in front of the ears, and this band is not divided by longitudinal black streaks, though occasionally there is one in the middle, and others running upwards from the eyes. The muzzle in front of and including the eyes, the top of the head, ears, and sides of neck are dark brown or sooty black, but generally a whitish spot can be detected below the eye, and this sometimes is joined to the frontal band. The markings are very variable, and occasionally either the dorsal stripes, or the pale frontal band, or both are scarcely perceptible [1]. Vibrissæ black, the lowest occasionally white near the base.

[1] A remarkable variety from Mergui entirely destitute of markings is noticed in a note to p. 791.

Dimensions. Nearly the same as those of *P. niger*. Cantor says in the largest specimen he measured the head and body together were $24\frac{1}{2}$ inches long. In another the head and body $20\frac{1}{2}$, tail $16\frac{1}{2}$. In a Tenasserim specimen measured by Tickell the head and body measured $20\frac{1}{2}$ inches, tail $20\frac{3}{4}$. Horsfield gives 22 and 18. All the above measurements were, I believe, made on fresh specimens.

Distribution. *P. hermaphroditus* ranges throughout the countries east of the Bay of Bengal—Burma, Siam, Malay peninsula, &c. It is found also in Sumatra, Java, Borneo, and some of the smaller Indo-Malay islands, extending to Ceram and even the Ké Islands (P. Z. S. 1858, p. 113), but perhaps introduced. In Lower Bengal and at the foot of the Himalayas, in Nepal and Sikhim, some of the *Paradoxuri* appear to belong to this species, or to be intermediate between it and *P. niger*.

Before proceeding to discuss the synonymy it is necessary to deal with the differences between this and the last species. Although the two have been classed apart by a great majority of naturalists, by all in fact except Blyth and Jerdon, it is, I think, quite as much a question of convenience as of facts whether the Indian and Malay types of the common *Paradoxurus* should be considered species or subspecies, that is geographical races. Both are variable, but the vast majority of specimens are readily distinguished by some or all of the following characters:—

1. The back is usually striped in *P. hermaphroditus*, unstriped in *P. niger*.
2. There is generally a distinct grey or whitish transverse frontal band in *P. hermaphroditus*, not in *P. niger*.
3. The fur in *P. niger* is usually longer, more ragged, and provided on the upper parts with long black tips, which are wanting in *P. hermaphroditus*; in the latter the fur is generally of more even length.
4. The inner lobe of the upper sectorial tooth is much larger in *P. hermaphroditus*, so that the breadth of the tooth at right angles to the outer margin is about $\frac{8}{10}$ the length of that margin, whilst in *P. niger* the proportion is $\frac{7}{10}$[1]. The inner lobe is, as a rule, not quite at the distal extremity of the tooth in the former, and the inner margin from the inner lobe to the hinder extremity is straight; in *P. niger* the inner lobe is quite at the distal extremity, and the inner margin concave.
5. The muzzle is shorter in *P. hermaphroditus* than in *P. niger*.

There is, however, variation in all these characters—not one can be said to be constant. So far as I have seen, the shape of the upper sectorial is on the whole the best character, but even here I can find, in the large collection of skulls in the British Museum, a complete or nearly complete passage from one form to the other. But I believe the difficulty chiefly arises from the circumstance that whereas the animals inhabiting the peninsula of India (from the Himalayas to Cape Comorin) and Ceylon differ but little from each

[1] Mean of two measurements of *P. hermaphroditus* and four of *P. niger*.

other, and have in common the characters above noted as characteristic of *P. niger*; and whilst Burmese, Siamese, and Malay individuals have, with few exceptions, the coloration and dentition of *P. hermaphroditus* (*P. musanga*), intermediate varieties are found in Bengal and the countries about the head of the Bay of Bengal. Similarly the variety found in Borneo, and which is represented by several skins in the British Museum, may very possibly be a hybrid or an intermediate form between *P. hermaphroditus* and *P. philippensis*. Under these circumstances it is, I think, a mere matter of convenience whether the two forms are to be distinguished, as I have done, as *P. niger* and *P. hermaphroditus*, whether they are to be called two geographical races or subspecies, or whether, according to the system now in favour with some naturalists, they are to receive trinomial designations, e. g. *P. hermaphroditus niger* and *P. hermaphroditus musanga*[1].

Synonymy. The first question here is the propriety of giving to this species or race the name *hermaphroditus* rather than to the Indian form, to which the name has been assigned by Gray and others.

The reasons for using the name *hermaphroditus* for the present species are two in number. (1) *Viverra hermaphrodita* was described as having three black stripes on the back. The presence of distinct longitudinal bands is the rule in the Malay form, whilst it is exceptional in the Indian. The light grey margin in front of the ears, too, noticed in Pallas's description, agrees better with the grey frontal band of the Eastern type. (2) We may regard *hermaphroditus* as a name applicable to either form, and therefore as including both. In this case, by the Linnæan rule for genera, the name is retained for that portion of the original species which remains after a defined section has been separated. The first section thus separated from *P. hermaphroditus* received the specific name of *niger*, and consisted of the Indian form, so *hermaphroditus* should be confined to the Malayan type. Another circumstance in favour of applying Pallas's name to the latter is the greater probability of a specimen in a German collection of the last century having been derived from Java or one of the Malay islands.

Several of the synonyms given above may possibly belong to *P. niger*, or to some of the intermediate varieties. The rule adopted has been to class all distinctly striped forms and all with a well-marked frontal band under *P. hermaphroditus*.

The figure representing the type of *Viverra prehensilis* is distinctly striped, and is therefore referred here. The tail-tip is white. About *V. musanga*, the Sumatran form described by Raffles, there can be no question. *P. dubius* was founded on the skin of a Javanese animal, not half grown, because it did not agree with the young of *P. musanga*. Both, however, were described (Gray, P. Z. S. 1832,

[1] Personally I think this plan has but little to recommend it, and that it must lead to confusion, because it makes no distinction between geographical races and ordinary varieties, to say nothing of mutations or what may be termed geological varieties, although all these forms of variation are perfectly distinct

p. 66) as ash-coloured (one pale ash, the other *flavescenti-cinereus*), with three dark dorsal bands and spots on the sides; and it is not clear what the supposed specific distinctions were. The type is in the British Museum, and presents no peculiarity.

P. pallasii was founded on a skin now in the British Museum, and showing the whitish frontal band distinctly, but in other characters approximating to *P. niger*, there being no stripes on the back, where the fur has long black tips. There is no skull, so the characters of the teeth cannot be examined. The figure in Gray and Hardwicke's Illustrations, if taken from this specimen, is very incorrectly coloured, the markings being much exaggerated. The circumstance that Gray (P. Z. S. 1861, p. 136) identified two Cambodian skins with *P. pallasii* is in favour of the name being considered a synonym of *P. hermaphroditus*.

The type of *P. crossii* was a specimen kept in confinement; the characters of the fur are consequently not to be depended upon; the upper sectorial tooth in the skull figured[1] is broader than it usually is even in *P. hermaphroditus*, and quite unlike that of *P. niger*.

P. finlaysonii was founded on "a rough sketch brought by Mr. Finlayson from Siam"! From the description the animal represented was probably a typical example of *P. hermaphroditus*.

"*P. quinquelineatus* and *P. musangoides*, Gray, are perhaps only varieties of the young animal of this species (*P. fasciatus=musanga*)."[2] Except that I should substitute a stronger term than "perhaps," I have for once the satisfaction of concurring in Dr. Gray's opinion. Nothing is known of the types of these supposed species.

Of *P. nubiæ* I hope to obtain further information. There is nothing in the figure or description to show that the animal differs from *P. hermaphroditus*; but the locality was given as Nubia apparently on trustworthy evidence, the animal having been brought alive to Paris by a Mr. Burton of Bordeaux. Wagner's name *P. felinus* was, as already remarked, merely substituted for *hermaphroditus*.

Of Gray's *Paradoxurus nigrifrons*, the description of which only appeared in 1864, its author admits that the skull is very much like that of *P. crossii*[3], and on the next page that "the nature and colour of the fur" are very similar in both; but *P. nigrifrons* "is rather darker in every part, and the crown and cheeks are reddish black, being in *P. crossii* grey or whitish." Both specimens, it should be remembered, had been kept in confinement.

Hombron and Jacquinot described *P. setosus* from a young specimen obtained at the island of Ceram. The skull is figured, and shows the milk-teeth. There is nothing in the description or figure to justify the separation of the form.

The type of *P. strictus*, Hodgson, is a skin with short fur; the dorsal stripes and rows of spots are unusually distinct and numerous.

[1] P. Z. S. 1864, p. 535.
[2] P. Z. S. 1864, p. 537.
[3] P. Z. S, 1864, p. 534.

Probably the animal had just shed its winter coat, and the hair may have been worn. There is only a fragment of the skull left. *P. quadriscriptus* of Hodgson is a well-striped form with long hair, having doubtless been killed in the cold season. There is no skull at all in this case. Both may be safely referred to *P. hermaphroditus.*

P. crassiceps of Pucheran is said to have been remarkable for the size of its head (no dimensions, however, are given) and the great development of the silvery-white mark on the forehead. The description is not sufficient for satisfactory determination. *P. fasciatus* has been already disposed of.

3. Paradoxurus philippinensis.

? *Martis species*, Camelli, Phil. Trans. xxiv. p. 2204 (1706).

Paradoxurus philippinensis, Jourdan, Comptes Rendus, v. p. 523 (1837).

P. zeylanicus, Gray, List Sp. Mam. B. M. 1843, p. 55.

P. philippensis, F. Cuv. An. Sc. Nat. sér. 2, viii. p. 372 (1837); Temm. Mon. Mam. ii. p. 339; Wagner, Schreb. Säugeth. Supp. ii. p. 355; Schinz, Syn. Mam. i. p. 387; Giebel, Säugeth. p. 799; Gray, P. Z. S. 1864, p. 537; Cat. Carn. &c. Mam. B. M. 1869, p. 70.

Structure very similar to that of *P. niger* and *P. hermaphroditus,* but size rather smaller. Fur closer and softer, less ragged and more even in length, and the hairs having a peculiar gloss. Underfur thicker and more woolly. The upper sectorial has a very large inner lobe nearly in the middle of the tooth, the length of the outer margin being very little more than the breadth of the tooth at right angles to that margin.

Colour dusky brown above, brownish grey below, either no markings on the back or indistinct rows of spots. The underfur is dark grey or blackish; the longer hairs are light brown with black tips. Head mostly black or blackish brown, feet and tail the same. The pale band across the forehead and spots under the eye occur as in *P. hermaphroditus,* but less distinct.

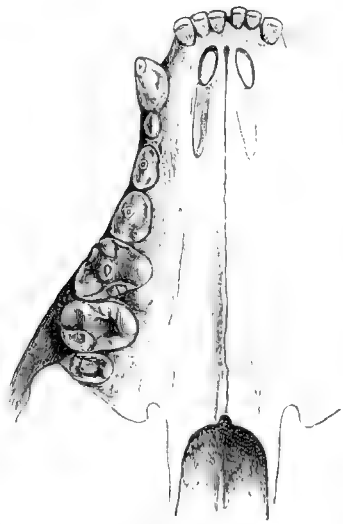
Dimensions. No trustworthy measurements are available; the head and body appear to be about 18 inches long. Skull about 4·1.

Distribution. The Philippine Islands. There are in the British-Museum collection two skins from Borneo, apparently belonging to this form, and, as already remarked, all Bornean specimens look somewhat intermediate between *P. hermaphroditus* and *P. philippinensis.*

If *P. niger* and *P. hermaphroditus* are classed as races of one species, *P. philippinensis* must, I think, be added as a third race; the differences are about the same in each case.

Synonymy. Martes philippensis, Camelli, is quoted by Schreber as a possible synonym of Pallas's *Viverra zeylonensis,* and the same reference has been quoted by Gmelin, Gray, and others. Camelli, who was probably a missionary, gave a Latin list, which was printed in the 'Philosophical Transactions,' of the quadrupeds inhabiting the Philippine Islands, and in this list included a species of Marten. He used no such name as *Martes philippensis*, but his supposed Marten may have been the present *Paradoxurus*.

Fig. 3.



Half palate and dentition of *P. philippinensis*. (Spec. no. B.M. 42.2.15.242.)

Jourdan's description is very poor, but there is no reason to suppose that the species described by him was different. Temminck's description was taken from the Philippine specimens in the British Museum by Mr. Ogilby; but Temminck was mistaken in supposing that the *Ambliodon doré* of Jourdan was the same species.

4. Paradoxurus macrodus.

Paradoxurus macrodus, Gray, P. Z. S. 1864, p. 538; Cat. Carn. &c. Mam. B. M. 1869, p. 70.

This species is only known by a skull preserved in the British-Museum collection. This skull was received from the Zoological Society many years ago, when the Society's museum became a part of the National Collection. Nothing is known of the locality or history of the specimen, and the skin has not been preserved.

The general form of the skull, which has been figured in the Society's 'Proceedings' and in the British-Museum Catalogue, differs in no respect from that of *P. hermaphroditus*, but the teeth are very much larger, the sectorial in both upper and lower jaw and the first true molar in the upper and fourth premolar in the lower especially. It is true that there is a gradual increase in size in these teeth from Indian or Ceylonese examples of *P. niger* to Bornean skulls of *P. hermaphroditus*, but the difference between the latter and *P. macrodus* is greater than that between the teeth of Ceylonese or Indian and of Bornean skulls.

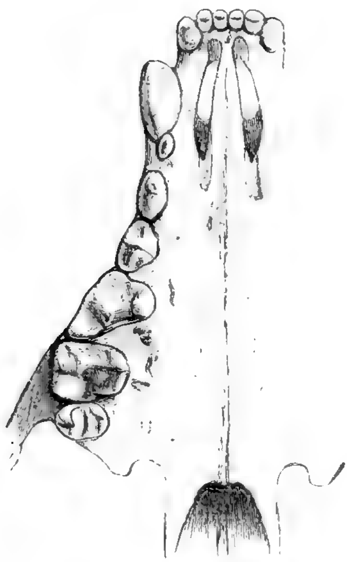
5. Paradoxurus jerdoni. (Plate XLIX.)

Paradoxurus jerdoni, W. Blanf. above, p. 613.

For description see the reference.

This species is distinguished by its uniform rich dark brown colour, slightly grizzled, owing to a subterminal grey ring on the hairs, which are of equal length, not ragged. The tip of the tail

Fig. 4.



Half palate and dentition of *P. jerdoni*, from type.

is white in the only two specimens examined. Dimensions apparently similar to those of *P. niger*. Skull nearly $4\frac{1}{2}$ inches long. The dentition is very like that of *P. aureus*. The anterior palatine foramina are much longer than in any other species, and extend back to a line drawn through the hinder edges of the anterior premolars.

6. Paradoxurus aureus. (Plate L.)

Paradoxurus aureus, F. Cuv. Mém. Mus. Hist. Nat. ix. p. 48, pl. iv. (1822); Desm. Mamm. Supp. p. 540; Gray, P. Z. S. 1832, p. 68.

Paradoxurus zeylanicus, Kelaart, Prod. Faun. Zeyl. p. 39 (1852); Blyth, J. A. S. B. xx. pp. 161, 184; Cat. Mam. Mus. A. S. p. 47; Gray, P. Z. S. 1864, p. 531; Cat. Carn. &c. Mam. B. M. 1869, p. 64 (*nec* Gray, List Sp. Mam. B. M. 1843, p. 55; nec *Viverra zeylonensis*, Pallas, Schreb. Säugeth. iii. p. 451; nec *V. zeylanica*, Gmel.).

P. montanus, Kelaart, *apud* Blyth, J. A. S. B. xx. pp. 161, 184; Kel. Prod. Faun. Zeyl. p. 40.

Tail about four fifths the length of the head and body. Fur moderately soft and thick, of uniform length, with but little woolly underfur.

Skull similar to that of *P. hermaphroditus*, and with the palate not prolonged behind. Inner lobe of upper sectorial well developed. The anterior upper true molar broader inside than in the common species, being nearly rectangular.

Colour uniform dull rusty red or dull chestnut (as Blyth remarks, very like that of the Common European Weasel), passing, however, in some specimens (*P. montanus* or *P. zeylanicus*, var. *fuscus*, Kelaart) into a browner tint. The fur and underfur of nearly the same colour throughout; no black tips to the fur. Faint longitudinal dorsal streaks may be detected on many specimens. A white subterminal band on the tail has been observed. Vibrissæ whitish in dried skins, probably the same colour as the other hairs originally.

Dimensions. A fully grown female, according to Kelaart, measured, head and body 19 inches, tail 15·5, height 8. Skull 4·15 inches long.

Distribution. The island of Ceylon, apparently throughout, the darker variety being from a considerable elevation.

This species may at once be distinguished by its colour. The dentition differs considerably from that of *P. niger*, the only other kind found in Ceylon, and proves that the present is not a rufous variety of that species.

Synonymy. It has already been shown that this *Paradoxurus* cannot be identified with *Viverra zeylonensis*, the colour being very different. Gray's original *P. zeylanicus* was *P. philippinensis*, and Kelaart appears to have been the first to apply the term *P. zeylanicus* to the present kind. Although F. Cuvier's name *aureus* was given to a very young specimen, there is no other species known to which the description "*couleur d'un beau fauve doré uniformément répandu sur tout son corps*" can apply.

7. PARADOXURUS GRAYI.

Paradoxurus grayi, Bennett, P. Z. S. 1835, p. 118; Wagner, Schreb. Säugeth. Suppl. ii. p. 340 (1841); Horsfield, P. Z. S. 1856, p. 396; Blyth, Cat. Mam. Mus. A. S. p. 48; Cat. Mam. Birds Burma, p. 26; Jerdon, Mammals of India, p. 128; ? Ball, Stray Feathers, ii. p. 369.

P. nipalensis, Hodgson, As. Res. xix. p. 76 (1836); J. A. S. B. x. p. 909, xi. p. 279; Calc. Jour. Nat. Hist. iv. p. 287; Wagner, Schreb. Säugeth. Supp. ii. p. 341; Schinz, Syn. Mam. i. p. 387.

Paguma grayii, Gray, List Sp. Mam. B. M. 1843, p. 54; Cat. Hodgs. Coll. B. M. 1846, p. 9; 2nd ed. 1863, p. 5; Horsf. Cat. Mam. Mus. E. I. C. p. 66; Gray, P. Z. S. 1864, p. 541; Cat. Carn. Mam. B. M. 1869, p. 73.

Paradoxurus tytlerii, Tytler, J. A. S. B. xxxiii. p. 188 (1864).

Larger than *P. hermaphroditus*. Tail about the same length as the head and body. Fur varying in length but uniform, not ragged; woolly underfur frequently well developed.

In the skull the constriction behind the postorbital process is less than in the preceding species, and the forehead between the orbits more rounded. The bony palate runs back above the posterior nares for 0·4 to 0·5 inch behind a line drawn through the hinder edge of the posterior molars, and is deeply concave at the end. Teeth smaller than in the preceding species; the inner lobe of the upper sectorial small, and the anterior upper true molar nearly triangular

Colour grey throughout, without markings on the body, the lower

Fig. 5.

Half palate and dentition of *P. grayi*. (Spec. no. B.M. 151 *b*.)

parts paler and whitish. Underfur brownish grey or dusky, paler towards the base, longer hairs whitish grey towards the end, the tips on the upper parts black. Frequently, though not always, the terminal half of the tail is dusky or blackish; feet usually brown. Head, including ears and chin, brown or blackish, with the exception of the forehead, a broad band beneath each ear, a narrower line down the nose, and a blotch or spot below each eye, where white hairs are conspicuously intermixed, but there is some variation in their proportion and distribution, and the markings are not distinct. Vibrissæ mostly white, some of the uppermost black.

Some specimens in the British Museum have a yellowish or brownish tinge, especially on the rump, thighs, and base of the tail.

Dimensions. Head and body 24 to 25 inches, tail with hair at the end about the same; weight 9 to 10 lb. (*Hodgson*). Skull 4·6 inches long.

Distribution. The Himalayas as far west as Simla; Assam, Arakan, and the Andaman Islands. Ball records it from Chutia Nagpur in South-west Bengal; and McMaster in his Notes on Jerdon, p. 37, suggests its occurrence in the Northern Circars, in the extreme north-east corner of the Madras Presidency; but both these observations require confirmation.

Synonymy. The types of both *P. grayi* and *P. nipalensis* are in the British Museum, and so is a specimen (skin and skull) of *P. tytleri*, which belonged, I believe, to one of Colonel Tytler's original specimens. The skull is rather smaller in size, but otherwise undistinguishable. The fur is thin, from the animal having been kept in confinement.

The synonymy of *P. grayi* in Gray's Monograph (P. Z. S. 1864, p. 541) is I think erroneous. Neither *P. bondar*, Temm., *P. leucopus*, Ogilby, *Amblyodon doré*, Jourdan, nor to the best of my belief *Paradoxurus auratus*, De Blainville, belongs to this species.

8. Paradoxurus larvatus.

Gulo larvatus, Temm.; Ham. Smith, Griffith's Cuv. An. King. ii. p. 281, with plate (1827).

Viverra larvata, Gray, Spic. Zool. p. 9 (1830).

Paguma larvata, Gray, P. Z S. 1831, p. 95; List Sp. Mam. B.M. 1843, p. 54; P. Z. S. 1864, p. 539; Cat. Carn. &c. Mam. B. M. 1869, p. 72; Swinhoe, P. Z. S. 1862, p. 354, 1870, p. 630, 1872, p. 817.

Paradoxurus larvatus, Gray, P. Z. S. 1832, p. 67; Illust. Ind. Zool. vol. ii. pl. 11 (1834); Temm. Mon. Mam. ii. p. 329, pl. 65. f. 1–3; Wagner, Schreb. Säugeth. Supp. ii. p. 351 (1841); Schinz, Syn. Mam. i. p. 384 (1844); Giebel, Säugeth. p. 798.

Smaller than *P. grayi*, but otherwise very similar.

Colour light brownish grey, the terminal portions of the tail and limbs, parts of the head, the neck and the back between the shoulders black or blackish, a broad white stripe down the middle of the forehead and nose, a white spot below the eye and another behind it, the two sometimes connected, all sharply defined against the remainder of the face, which is black.

Dimensions. No trustworthy measurements of body and tail available. Skull about 4 inches long.

Distribution. Southern China: Kwangtung and Fokien provinces, Hangchow, and Formosa.

9. Paradoxurus leucomystax.

Paradoxurus leucomystax, Gray, P. Z. S. 1836, p. 88; Charlesworth's Mag. Nat. Hist. i. p. 579 (1837); Temm. Mon. Mam. ii. p. 325, pl. 64. f. 4, 5, 6; Müller, Zoogd. Ind. Arch. p. 55; Wagner, Schreb. Säugeth. Supp. ii. p. 347; Schinz, Syn. Mam. i. p. 383; Giebel, Säugeth. p. 799; Blyth, Cat. Mam. Mus. A. S. p. 48 (1863).

P. jourdanii, Gray, Charlesworth's Mag. Nat. Hist. i. p. 579 (1837); Wagner, Schreb. Säugeth. Supp. ii. p. 355.

Ambliodon doré, Jourdan, Comptes Rend. v. pp. 442, 446 (1837); De Blainv. ibid. p. 593; An. Sci. Nat. sér. 2, viii. p. 276.

Paguma leucomystax, Gray, List Sp. Mam. B. M. 1843, p. 55; Cantor, J. A. S. B. xv. p. 200 (1846); Gray, P. Z. S. 1864, p. 540; Cat. Carn. &c. Mam. B. M. 1869, p. 73.

Paradoxurus ogilbyi, Fraser, Zool. Typ. pl. 10 (1849).

P. auratus, De Blainv. Ostéographie, *Viverra*, pp. 21, 96, pl. vii.

P. rubidus, Blyth, J. A. S. B. xxvii. p. 275 (1858); id. Cat. Mam. A. S. p. 48.

This is the largest species of the genus except *P. musschenbroeki*. Tail about three quarters the length of the head and body.

Colour in general rufescent brown, paler below; underfur greyish yellow at the base, the longer hairs bright rufous, and the tips dusky or black.

The terminal portion of the tail is black, the feet dark brown, hind neck and back between the shoulders blackish. The forehead and a broad band passing in front of each ear whitish, and sometimes the whole face (*P. ogilbyi*), but generally the muzzle as far as the eyes is brown. Some skins are much more red than others. Vibrissæ white, a few of the shorter above black.

Dimensions. The only trustworthy measurement I can find is by Cantor, who gives head and body 27 inches, tail 20. Skull about 5 inches long.

Distribution. The Malay peninsula, Sumatra, Borneo, and probably some of the other Malay Islands, but not Java.

Synonymy. The *Amblyodon doré* of Jourdan was identified with this species by De Blainville, and the description of the coloration agrees with this species and not with *P. grayi*. If, as stated by Gray, his *P. jourdanii* was probably founded on the same specimen, that name also falls into the synonymy. There is nothing in the description antagonistic to this view. *P. ogilbyi* of Fraser was identified with this species by Gray, and, I believe, correctly. *P. auratus* was merely the Latin equivalent of M. Jourdan's *Ambliodon doré*. Lastly, the description of *P. rubidus*, Blyth, presents no differences from *P. leucomystax*, and must, I think, be that of a redder variety than usual.

10. Paradoxurus musschenbroeki.

Paradoxurus musschenbroeki, Schlegel, Notes on the Leyden Museum, i. p. 43; Jentink, ib. v. p. 178.

Tail about three quarters the length of the head and body. Fur soft and short.

Skull resembling that of *P. hermaphroditus* rather more than that of *P. grayi* or *P. leucomystax* above, but with the bony palate produced as in the latter for some distance (0·35 inch in the specimen examined) behind a line drawn through the hinder edges of the last molars. The mesopterygoid fossa is narrow, the posterior opening of the alisphenoid canal further back than in other species, and close to the orifice of the foramen lacerum medium. The skull examined is imperfect behind and the bullæ wanting. Teeth large, the molars rounded, inner lobe of upper sectorial very large; fourth lower premolar with a high principal cusp.

But the most remarkable peculiarity of the skull and dentition is that the rows of upper premolars and molars, instead of diverging greatly behind, as in all other *Paradoxuri*, are nearly parallel, the hinder part of the palate being proportionately much narrower than in other species of the genus. The distance between the anterior premolars is 0·68 inch, between the last molars 0·77. In other species the latter measurement exceeds the former by at least one half.

Colour above rufous-brown, or rather light brownish chestnut, with numerous white hairs intermixed. Fur brown throughout, scarcely paler in colour at the base. The lower parts fulvous to white, breast rufescent. Hinder part of back paler than the shoulders, and marked with two slightly darker longitudinal bands, one on each side of the back, and by a few indistinct spots. Tail with alternating rings of darker brown and pale brown, not very strongly marked and becoming indistinct on the lower side, where the colour is paler, and also towards the tip, which is dark. No distinct head-markings. The cheeks below the eye and a spot above the eye pale, area in front of each eye darker, forehead and ears the same colour as the nape and hind neck. Vibrissæ partly white, partly brown.

Dimensions. Head and body of a large male 880 millim. (35 inches), tail 630 millim. (25 ins.) (*Jentink*, probably from a skin). Skull 5·75 inches long.

Distribution. Celebes.

11. PARADOXURUS (?) LANIGER.

Paradoxurus laniger, Hodgson, As. Res. xix. p. 79 (1836); J. A. S. B. x. p. 909, xi. p. 279; Calc. Journ. N. H. iv. p. 287; Wagner, Schreb. Säugeth. Supp. ii. p. 352; Gray, P. Z. S. 1864, p. 542; Cat. Carn. &c. Mam. B. M. p. 74.

Paguma? laniger, Gray, List Sp. Mam. B. M. 1843, p. 55; Cat. Hodgs. Coll. B. M. p. 9; 2nd ed. p. 5.

Tail only about half the length of the head and body, thick at the root and tapering gradually to the extremity. Toe-pads surrounded by hair, soles in all other respects as in other species of *Paradoxurus*. Claws short; a naked preanal area. Fur very woolly and close. No skull known.

Colour pale rufescent brown throughout the head (so far as preserved), body, and tail, the fur grey at the base, light brown towards the tips. No black-tipped hairs anywhere.

The only specimen known, a skin in bad condition, was obtained by Mr. Hodgson in Nepal, and was supposed to have been brought from Tibet. In J. A. S. B. xi. p. 279, Hodgson says that he received it from Tingri.

In the absence of any skull it is impossible to feel sure that this species belongs to *Paradoxurus*. There can be no question however, I think, that it is quite distinct from all other known species of that genus. The specimens doubtfully referred to it by Blyth (J. A. S. B. xxvii. p. 274, and Cat. Mam. Mus. A. S. p. 48) probably belong to *P. grayi*, like some skins similarly labelled in the British Museum.

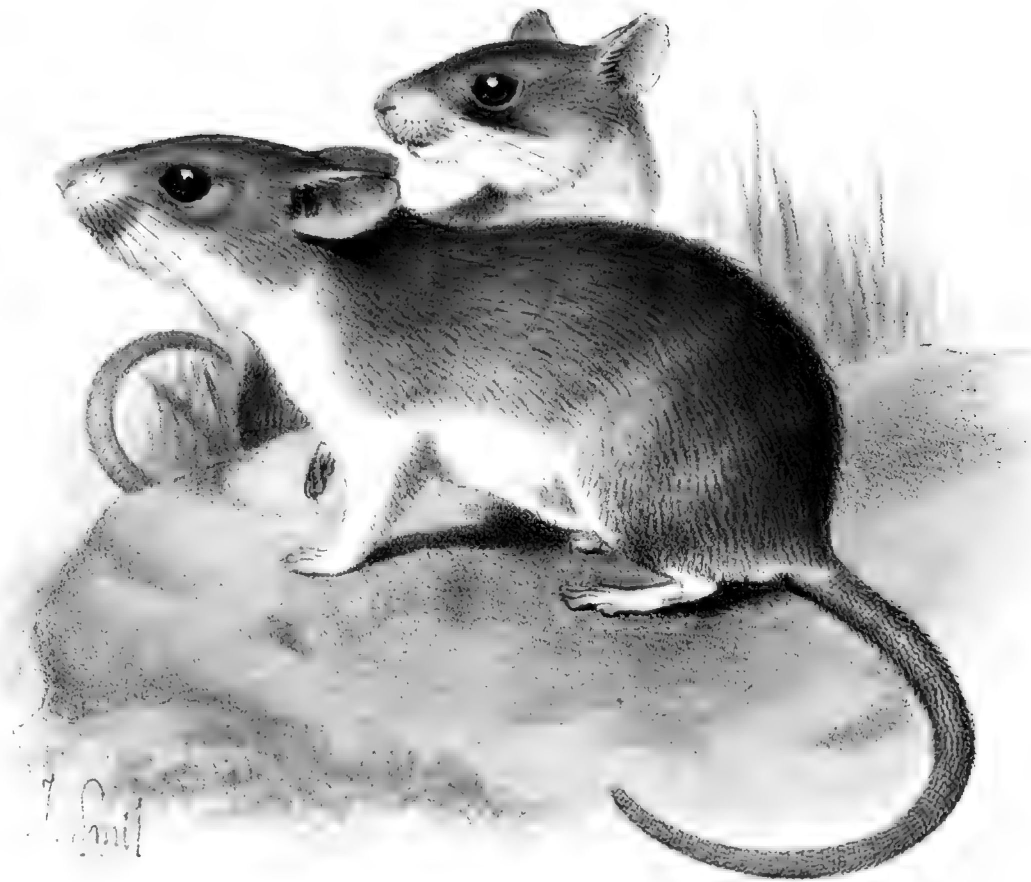
The following measurements, with the exception of those of *P. jerdoni*, are taken from skulls in the British-Museum collection.

Measurements of Skulls and Teeth, in inches.

(Lengths in brackets are approximate only.)

	Length[1].	Breadth[2].	Palate length[3].	Palate breadth[4].	Breadth behind orbits[5].	Length[6] P. 4.	Breadth[7] P. 4.	Length M. 1.	Breadth M. 1.	Length $\overline{\text{M. 1}}$.	Breadth $\overline{\text{M. 1}}$.
1. *P. niger*, Madras	[4·2]	2·3	1·92	1·27	0·53	0·33	0·24	0·23	0·31	0·4	0·22
2. Do., "Nepal," *P. hirsutus*, ♂	4·62	2·55	2·1	1·34	0·45	0·36	0·23	0·25	0·28	0·4	0·23
3. Do., Nepal, do	4·05	2	1·91	1·27	0·52	0·32	0·23	0·22	0·27		
4. *P. hermaphroditus*, ♀, Penang	3·94	2·13	1·85	1·27	0·48	0·31	0·26	0·23	0·3	0·34	0·23
5. Do., ♂, Pegu................	[4·13]	2·45	1·96	1·35	0·5	0·36	0·28	0·25	0·31	0·4	0·24
6. *P. philippensis*	[4·44]	2·26	1·85	1·3	0·45	0·31	0·3	0·23	0·33	0·37	0·23
7. *P. macrodus*....................	4·32	2·21	2·13	1·42	0·45	0·42	0·35	0·32	0·39	0·49	0·35
8. *P. jerdoni*	4·45	2·47	2·15	1·37	0·52	0·35	0·29	0·28	0·34		
9. *P. aureus*.......................	4·12	2·33	1·9	1·24	0·46	0·31	0·26	0·22	0·28	0·34	0·22
10. *P. grayi*	4·7	2·7	2·33	1·55	0·7	0·32	0·26	0·25	0·27	0·36	0·26
11. *P. larvatus*	4·0	2·35	1·9	1·26	0·8	0·3	0·23	0·23	0·24	0·31	0·22
12. *P. leucomystax*	[5·2]	2·92	2·53	1·62	1·06	0·4	0·29	0·3	0·36	0·42	0·27
13. *P. musschenbroeki*	[5·75]	2·55	2·55	1·33	0·63	0·35	0·33	0·29	0·36	0·34	0·19

[1] From occipital condyle to anterior border of premaxillaries.
[2] Across broadest part of zygomatic arches.
[3] From centre of termination above posterior nares to anterior border of premaxillaries.
[4] A line drawn through junction of upper sectorial and first true molar.
[5] Smallest breadth of brain-case behind postorbital processes.
[6] Length of upper sectorial parallel to outer margin.
[7] Breadth at right angles to the last.



J. Smit lith.

Hanhart imp.

MUS GLEADOWI.

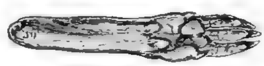
5. Description of a new Species of *Mus* from Sind. By James A. Murray, Curator Kurrachee Municipal Museum. (Communicated by Mr. W. T. Blanford.)

[Received August 26, 1885.]

(Plate LI.)

Mus gleadowi, sp. nov.

General colour above fulvous-brown, the hairs being dusky for about three fourths their length, then yellowish or fulvescent, and tipped with dark brown. No pure black hairs on the back. Entire under surface, sides of the belly, feet, chin, and throat, all round the snout, and the sides of the face white, except a dark brown streak under the eye. A rufescent circle round the eye. Tail ringed, slightly longer than the head and body, and covered with short hairs, dark brown dorsally, and white on the sides and below. Ears dusky all round the edge for about one half of their length, and covered



Hind foot of *Mus gleadowi*, enlarged 1½.

inside and out with short white hairs; laid forward they reach the front edge of the eye. Lower series of whiskers entirely white; upper series black at the base, and tipped more or less broadly with white.

Length.—Head and body of a pregnant female 3·25 inches, tail 3·37; of an adult male, head and body 3·25 inches, tail 3·1.

Mammæ three pairs, two inguinal, one pectoral. Foot-pads five on each fore foot, four on each hind foot.

This species lives in burrows at the foot of salt-wort bushes in the Clifton Plain, Kurrachee. It is quite nocturnal, leaving its burrows about 7 P.M., and running all over the plain.

Note by W. T. Blanford.—The description above printed has been sent to me by Mr. Murray, together with two adults, one of each sex, and one young individual of *Mus gleadowi* in spirit. In both of the adults I find that the tail is now slightly shorter than the head and body; and I observe that although in the male the coloration of the head is as described above, in the female the sides of the head, including a narrow band above each eye, are pale fulvous, and there is no distinct dark brown streak below the eye. The following are the dimensions in spirit, measured as are those of

Indian Rats and Mice given by Mr. Oldfield Thomas, P. Z. S. 1881, p. 525:—

	♂.	♀.
	inches.	inches.
Head and body	3·4	3·5
Tail from anus	2·9	3
Hind foot	0·72	0·7
Fore arm and hand	0·88	0·87
Ear-conch, length (outside)	0·58	0·63
Muzzle to auditory meatus	—	1

Both skulls are much broken; that of the male has been extracted, and measures an inch in length from the occiput to the anterior termination of the premaxillaries, 0·15 across the frontals where narrowest between the orbits; the length of the row of upper molars is 0·2, of the lower molars 0·17. The skull closely approaches in form to that of *Mus mettada*, except that it is more convex above. The dentition of the two species appears to me quite similar except in size.

Mus gleadowi is indeed in many respects a miniature of *Mus mettada*. It has the same form of hind foot, with the hinder foot-pads wanting, though the deficiency appears carried further in the new species, judging by the specimens sent, in which only four pads are present, than it usually is in *M. mettada*, in which five is the usual number, though but four are often found. The small number of pads on the hind feet distinguish these two forms from all other Indian species of *Mus*, which have six, all well developed.

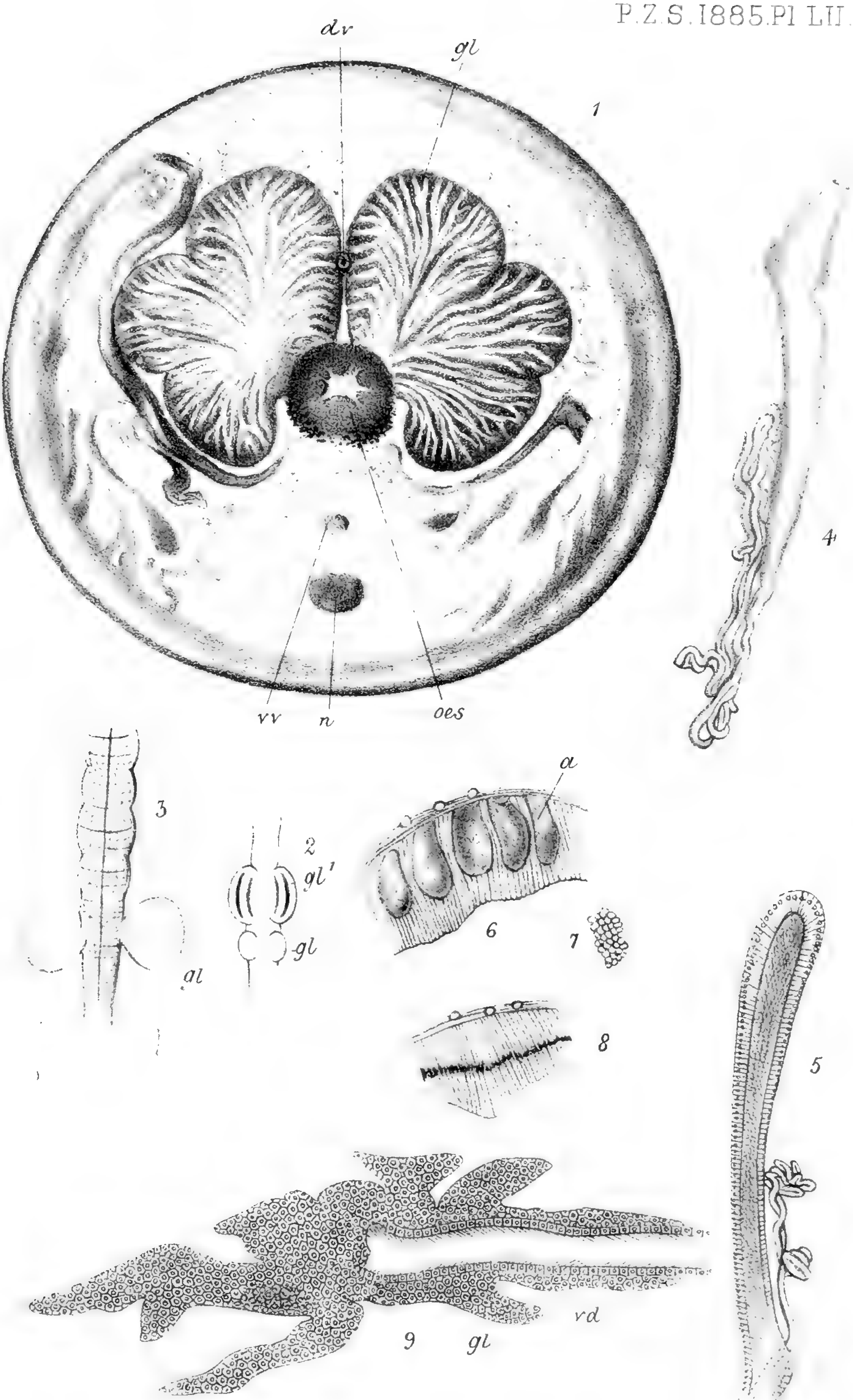
From *M. mettada* the present species is distinguished by its much smaller size, and especially by its very small feet and tarsi—the latter being much longer in proportion to their diameter than in *M. mettada*—by the colour being very much lighter, sandy brown with a slight greyish tinge above, and pure white below, and by having only six mammæ instead of eight. The eyes, too, appear proportionally much larger in *M. gleadowi*.

6. On the Specific Characters and Structure of certain New-Zealand Earthworms. By Frank E. Beddard, M.A., F.R.S.E., F.Z.S., Prosector to the Society.

[Received October 1, 1885.]

(Plates LII. & LIII.)

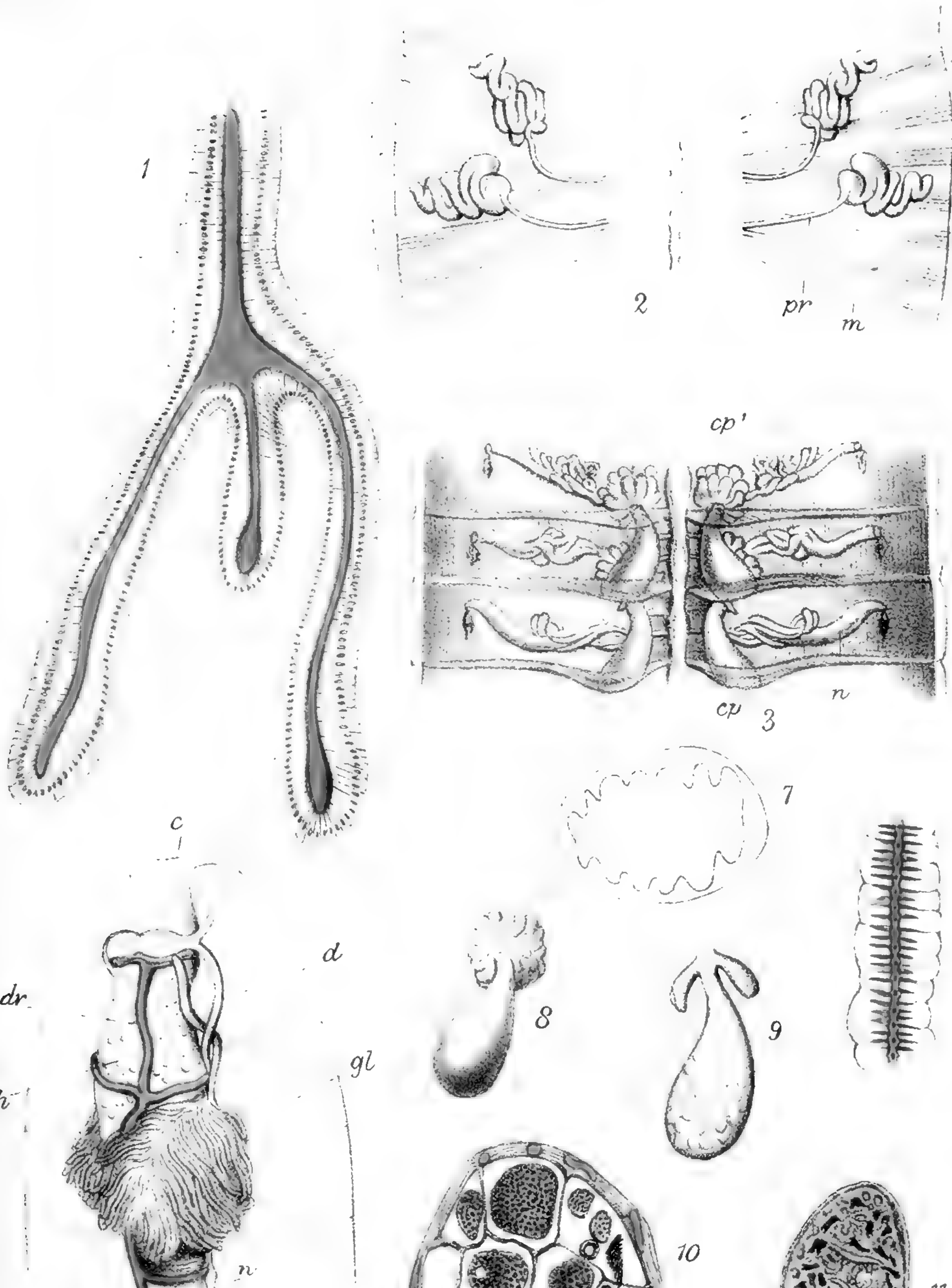
I have lately received through the kindness of Prof. T. J. Parker, of Otago University, Dunedin, New Zealand, a number of excellently preserved Earthworms collected in the neighbourhood of that town. The specimens proved to belong to three distinct species, all apparently referable to Perrier's genus *Acanthodrilus*. I have been able to study



F.E.B & A.S. Barnes delt.

Hanhart imp

STRUCTURE OF ACANTHODRILUS.



F.E.B. del[t]. Hanhart imp.

STRUCTURE OF ACANTHODRILUS.

these specimens in some detail, and venture to offer to the Society an account of their structure which will, I hope, help to fill up a gap in our knowledge of the anatomy of Earthworms; at present, beyond a few short descriptions of some six species of this genus, the anatomy of *Acanthodrilus* is entirely unknown. I have endeavoured in the present communication to treat of the structure of this genus in as thorough a fashion as possible, and have taken as my models the excellent memoirs of M. Perrier on *Urochæta*[1] and *Pontodrilus*[2]. The anatomy of all three species will be dealt with together, and will form the second part of this paper; the first part contains some remarks upon the genus and a brief description of three new species.

Part I.

The genus *Acanthodrilus* was instituted by M. Perrier in his 'Recherches pour servir à l'histoire des Lombriciens terrestres.'[3] It belongs to his group "Postclitelliens," inasmuch as the male generative openings are situated *behind* the clitellum. The structural characters which serve to distinguish this genus from others are:—The presence of four male generative openings, each of which is furnished with a bundle of long, peculiarly modified penial setæ, enclosed in a special muscular sac, the ends projecting through the apertures: there is furthermore a prostate gland in connection with each of these apertures; the vasa deferentia remain distinct from each other, and pass down the body from their anterior funnel-shaped internal apertures to their external apertures as four distinct tubes. The setæ are disposed in pairs as in *Lumbricus*.

M. Perrier described three species—*A. obtusus* and *A. ungulatus* from New Caledonia, and *A. verticillatus* from Madagascar. A fourth species of this genus was collected in Kerguelen during the Transit-of-Venus Expedition, and described by Prof. Lankester[4] under the name of *A. kerguelenensis*. More recently Dr. Horst has recorded the structural characters of two large species from Liberia, which he has named respectively *A. büttikoferi* and *A. schlegelii*[5]. Finally, I have myself described a seventh species from the Cape of Good Hope, under the name of *A. capensis*[6]. I shall take the opportunity presently of making some remarks upon the structural characters of these in connection with the new species to be recorded in the present paper.

Little or nothing is known about the New-Zealand Earthworms; and, so far as I am aware, there is no anatomical description of any one of the species, some seven in number, which have been recorded by Baird and Hutton[7] from this locality.

Captain Hutton, C.M.Z.S., has briefly described four species of

[1] Arch. d. Zool. Exp. t. iii.
[2] Arch. d. Zool. Exp. t. ix.
[4] Phil. Trans. extra vol. 1879.
[3] Nouv. Arch. d. Muséum, t. viii.
[5] Notes from Leyden Museum, vol. vi.
[6] Proc. Roy. Phys. Soc. 1884–85, p. 369.
[7] Proc. Linn. Soc. vol. xi. p. 96.

Lumbricus and three species of *Megascolex* in a paper published in the 'Transactions of the New-Zealand Institute'[1]; but as that author has merely referred to external characters, it is impossible to speak with certainty as to the identity or non-identity of the species which I propose to describe in the present paper with any of his. The practical impossibility of distinguishing species of Earthworms from each other by external characters only is so well known to those who have occupied themselves with the anatomy of the group, that I need scarcely insist upon it here. When, however, the relations of external characters to internal structure are known, something may be said about the systematic position of an Earthworm from its external characters, though, speaking generally, it would be unsafe to assign it to any particular genus without dissection. As far as we know at present, the genus *Acanthodrilus* can be so distinguished; the four male generative apertures on or in the neighbourhood of the sixteenth and eighteenth segments, each with the penial setæ protruding, are distinctive of *Acanthodrilus.*

After reading carefully Hutton's description of his four species of New-Zealand *Lumbrici,* I am inclined to think that three at least do not fall within the genus *Lumbricus* as at present defined and understood; these are *L. uliginosus*, *L. campestris,* and *L. levis.* In all the clitellum occupies from five to six segments situated in the anterior region of the body between segments 10 and 25; the "male genital apertures" are stated to be on the 9th segment (*L. campestris*), the 9th and 10th (*L. uliginosus*), or upon the 10th to the 15th (*L. levis*). The "vulvæ" are upon the last two segments of the clitellum. It is possible that *L. levis* is the type of an altogether new genus, but the other two species appear to me to belong to the genus *Acanthodrilus.* What Captain Hutton, following Hoffmeister, terms "vulvæ" are, I should imagine, the male genital apertures, while his "male genital apertures" may be the orifices of the spermathecæ. If my suppositions are right as to the meaning of the terms used in Hutton's descriptions, there is every probability that *L. campestris* and *L. uliginosus* are representatives of the genus *Acanthodrilus,* more particularly since this genus undoubtedly does occur in New Zealand, as will appear from my own descriptions. On the other hand, the fourth species of *Lumbricus* (*L. annulatus*) described by Captain Hutton does really seem to belong to the genus *Lumbricus,* as far as one can judge from its very incomplete definition. To the three species described in the present paper I give new names, because they appear, so far as I can make out, to differ specifically from those described by Captain Hutton; they may prove, however, to be identical; a comparison of types can alone settle the question.

The three species which I am now about to describe clearly differ from each other sufficiently to warrant their separation as distinct species. I have regarded them all as belonging to Perrier's genus *Acanthodrilus,* because they possess four male generative apertures each furnished with a prostate gland. The only other genus known

[1] Vol. xi. p. 317; see also vol. ix. p. 350.

in which there are four male generative apertures is *Moniligaster*, but in this genus the position of the orifices is different, and the anatomy of the worm is in other respects quite different from that of *Acanthodrilus*.

ACANTHODRILUS NOVÆ ZELANDIÆ, n. sp.

Setæ disposed as in *Lumbricus* in four series of pairs. Clitellum occupies 8 segments (12–19 inclusive); it is saddle-shaped, having a ventral area upon which there is no glandular development; on segments 16 and 18, corresponding to ventral row of setæ, are male genital apertures through which penial setæ protrude. The apertures of the copulatory pouches are between the 6th and 7th and between the 7th and 8th segments. The apertures of the oviducts are paired, and upon the 14th segment.

The apertures of the nephridia alternate in position from segment to segment, sometimes they are in front of the dorsal, sometimes of the ventral pair of setæ. The nephridia are furnished with a long muscular duct and a minute diverticulum, or have a large diverticulum and no muscular duct; the former are the dorsal series, the latter the ventral. The dorsal vessel is formed of two trunks anteriorly, which unite where they perforate the intersegmental septa. The intestine is unprovided with cæca or glands of any description. The testes are two pairs of racemose glands in segments 11 and 12; the vasa-deferentia funnels open in segments 10 and 11; the external apertures of the vasa deferentia are accompanied by a bundle of penial setæ and long coiled tubular prostatic gland; the ovaries are in segment 13; the oviducts perforate the mesentery, dividing this from segment 14. There are two pairs of spermathecæ in segments 7 and 8; each is a round sac with a short duct, round which are clustered a group of accessory diverticula.

ACANTHODRILUS DISSIMILIS, n. sp.

This species is very closely allied to the last, and only differs, so far as I have been able to make out, in two points. The dorsal vessel is a single tube, and the copulatory pouches are furnished with only a single pair of large diverticula, one on either side.

ACANTHODRILUS MULTIPORUS, n. sp.

This species differs considerably from the two last. Like *A. novæ zelandiæ*, it attains to a length of from 10 to 12 inches and ½ an inch in diameter. The setæ are disposed in eight equidistant rows of a single seta each. The clitellum occupies the same segments as in the last species, and the male genital apertures have the same position and correspond to the outermost of the two ventral setæ; there are no special penial setæ. The apertures of the spermathecæ are between 7 and 8 and between 8 and 9; they correspond in position to the outermost of the two ventral setæ.

The spermathecæ appear to be simple spherical pouches without any diverticula. The nephridia are small and delicate; each segment is furnished with 8 nephridial pores corresponding to the 8 setæ;

in the anterior part of the body there are a larger number of pores, forming a continuous ring round the body and between the setæ.

The dorsal blood-vessel is formed of two tubes which remain distinct throughout the body. The pharynx is provided with a large gland consisting of metamorphosed nephridia; this opens into the buccal cavity by a long duct. The intestine has no cæca or glands.

The above descriptions contain the main specific characters of these species. I shall now proceed to review their external and structural characters in greater detail, comparing them with each other, with other species of the genus, and with other genera.

Part II.

§ *Integument.*

Under this head will be discussed the external characters of the genus *Acanthodrilus*, as well as the structure of the integument.

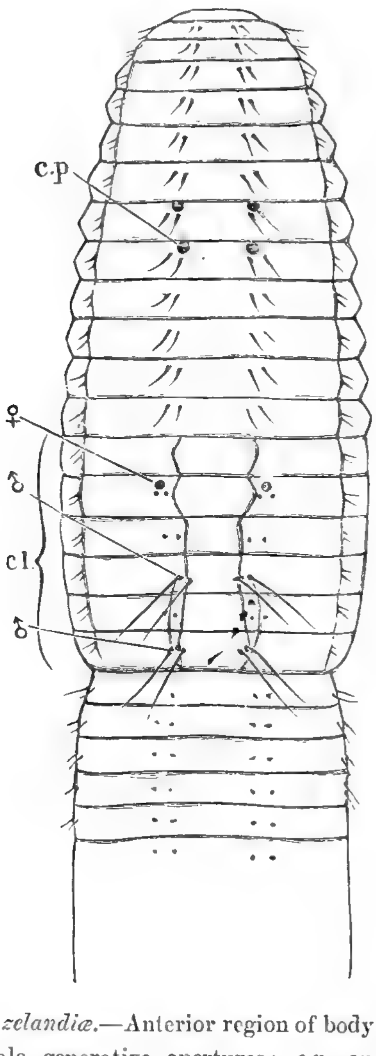
Clitellum.—In the specific definition it has been already stated that the clitellum occupies in all the three species under consideration eight segments, from the 12th to the 19th inclusive. In other species the extent of this modified region of the integument appears to be different. In *A. ungulatus* it only occupies four segments, from the 14th to the 17th; *A. büttikoferi*, on the other hand, has a clitellum which is only one segment short of *A. multiporus* &c., reaching as it does from the 13th to the 19th segment.

M. Perrier, as is well known, has divided Earthworms into three great groups, characterized by the different relations borne by the male generative apertures to the clitellum: in the Preclitellians the male generative pores are placed in front of the clitellum, in the Intraclitellians within it, and in the Postclitellians behind it. Now, in all the three species of *Acanthodrilus* described in the present paper, as well as in one species (*A. schlegelii*) described by Dr. Horst, the male generative apertures are placed *within* the clitellum; M. Perrier's location of the genus *Acanthodrilus* within the group of Postclitellians depends upon the examination of a single species referred to above, viz. *A. ungulatus*. As M. Perrier's classification in this instance at least separates species so closely allied as *A. ungulatus* and *A. schlegelii*, or any of the species defined in the present paper, it is evidently based upon characters which are not of final importance.

We are at present acquainted with so very few Earthworms, comparatively speaking, that the time has hardly arrived for a systematic arrangement of the whole group. It seems to me, however, that if any primary division is possible at all, it should be between the Preclitellian group on the one hand and the Intra- and Postclitellian on the other. The two latter have a good many characters in common which are not shared by *Lumbricus*; as instances may be mentioned the general presence of prostates, the position of the gizzard, strung on to the œsophagus, instead of being placed at its posterior extremity, the position of the testes and spermathecæ in different segments, the communication of the transverse hearts with the supra-intestinal vessel, &c.

The clitellum in *Acanthodrilus*, as in many other Earthworms, is saddle-shaped; the only other form of clitellum met with is in

Fig. 1.



Acanthodrilus novæ zelandiæ.—Anterior region of body from ventral surface.

cl. clitellum, ♂, male generative apertures; *c.p.* apertures of copulatory pouches; ♀, female generative aperture, with long penial setæ. Inside of the generative apertures is a line which marks the boundary of glandular region of clitellum; this is not continued on to 12th and 19th segments, which are only partially occupied by the extension of the clitellum.

such forms as *Perichæta*, where the clitellum completely encircles the whole body. The peculiar form of the clitellum appears, however, in this genus to bear some relation to the development of the male generative orifices; it ceases to exist where these structures are placed; in *A. ungulatus*, where the generative organs are placed behind the clitellum, the latter is developed all round the body as in *Perichæta*.

Setæ.—In *A. novæ zelandiæ* and *A. dissimilis* the setæ are disposed in four series of pairs, which is the typical arrangement of this genus; in *A. multiporus*, as well as in Lankester's *A. kerguelenensis*, the two setæ of each pair become widely separated from each other, so that there are eight longitudinal and nearly equidistant rows of a single seta each. An intermediate condition is offered by *A. schlegelii* and *A. capensis*, where the setæ are at first paired but subsequently come to lie further apart.

I have not been able to detect any characteristic differences in the shape of the setæ in the three species. In *A. multiporus*, and apparently in this species only, the setæ are furnished with a pair of remarkable glands which do not seem to have been described in any other Earthworm. I have figured these in a paper upon the nephridia of this species, which will shortly be published in the 'Annales des Sciences Naturelles.' These glands are more or less pear-shaped, and terminate in a duct which approaches and possibly pours its secretion into the seta-sac; the relations of these glands to the seta reminded one very forcibly of the sebaceous glands of the hair-follicle to the hair. A considerable space is left in the longitudinal muscle-coat round each seta, which is partly occupied by a delicate network of connective tissue, and is traversed by the special muscles which serve to move the seta. In this network the glands referred to lie one rather in front of, and one rather behind the seta; they are composed of rounded cells each with a very distinct nucleus; they are not concerned, or at least they are not directly concerned, in the production of new setæ. The young setæ appear first in the substance of large peculiar cells placed below the setæ, as has been described by Perrier and Vejdovsky, which have no relation whatever to these glands; it is possible that they produce some poisonous secretion, which secures to the worm protection from its foes; they may correspond.

The structure of the integument presents no special peculiarities: the epidermis consists of the ordinary columnar cells, among which are dispersed larger oval glandular cells; these latter are absent round the various apertures (setæ, nephridia, copulatory pouches, &c.) which pierce the integument. Between the epidermis-cells at their bases is a quantity of granular matter which has the appearance of pigment. The ultimate ramifications of the vascular system do not penetrate within the epidermic layer, except in the region of the clitellum; and I mention this fact because in certain Earthworms the epidermis is vascular. In *Megascolex*[1] and in *Perionyx*[2] at any rate there are intra-epithelial capillaries. The study of species of *Perionyx* from Manilla, which I owe to the kindness of my friend Mr. H. E. Barwell, and which may or may not be identical with the species referred to above, enables me to confirm this statement.

[1] Trans. Roy. Soc. Edin. vol. xxx. pt. 2.
[2] Proc. Roy. Phys. Soc. 1883–84, p. 89.

§ *Alimentary Canal.*

The alimentary tract of *Acanthodrilus*, as of other Earthworms, consists of a straight tube passing from the ventrally placed mouth at the anterior extremity to the terminal anus; it is specialized into several distinct regions.

The buccal cavity passes almost immediately into a large wide pharynx, which is attached to the body-wall by a mass of muscular bundles of various thickness; in the pharyngeal region the mesenteries, which posteriorly limit the segments, are no longer recognizable, but have become metamorphosed into this mass of muscles.

In *A. dissimilis*, and probably also in *A. novæ zelandiæ*, a quantity of glandular tissue lies on the dorsal surface of the pharynx between the muscular fibres, which, no doubt, represents a salivary gland such as that which Perrier has described in *Pontodrilus*. I have been unable, however, to make out the ducts of these glands.

In *A. multiporus* there are also salivary glands, which I am inclined to think are morphologically different from those of *A. dissimilis*. At the sides of the pharynx in segment 4 (Plate LIII. fig. 4, *gl*) are a pair of large arborescent glandular masses; the tubules which compose the gland of either side unite to form a slender duct (*d*), which is accompanied by a blood-vessel giving off capillaries which ramify over its walls. I traced the duct as far forward as the circum-œsophageal commissure; at this point it passed under the commissure to open out the buccal cavity by a very conspicuous orifice (see fig. 5, *o*). The three anterior segments of the body occupied by this pair of glands and their ducts have no nephridia; and as the structure of these glands resembles exactly that of the nephridia, there is little doubt that they are the slightly modified representatives of the nephridia of these segments; the most anterior nephridia were in the fourth segment, *i. e.* the third in front of that which contains the most anterior pair of copulatory pouches. Each gland consists of a multitude of cæcal (?) tubes accompanied by an abundant supply of capillaries. Distally, the gland-tubules consist of rows of perforated cell quite similar to those of the distal section of the nephridia in *Lumbricus* &c.; this portion of the tubule forms a complicated coil. Where the tubules unite together the character of the epithelium changes, and the duct comes to be surrounded by a row of cells instead of being contained within the substance of the cell. As the glands open into the buccal cavity, they may be termed salivary glands; they appear to correspond to the "glande à mucosité" described by Perrier in the genus *Urochæta*[1]: there are two of these glands situated in the anterior region of the body, each opening by its own duct *on to the exterior* in the third segment. Like the salivary glands of *Acanthodrilus*, the mucous glands of *Urochæta* have precisely the same structure as the nephridia; and the fact that the latter are wanting in those segments of the body which contain the glands and their ducts is an additional argument for supposing, as

[1] Arch. de Zool. Exp. t. iii. p. 439, pl. xvi. figs. 35, 37, 43.

Perrier suggests, that they are the homologues of the nephridia belonging to these segments. Similar glands are stated by Perrier to occur in *Perichæta*, but in this genus it was not possible to observe the external aperture of the glands. Seeing that the buccal cavity is morphologically external, it is not surprising to find that the same glands may in some cases open directly on to the exterior, and in other cases indirectly by means of the buccal cavity. Similar glands are also found in many of the Limicola; Vejdovsky in his 'Monographie der Enchytræiden'[1] records their presence in several species of *Enchytræus*, *Anachæta*, and other genera, comparing them with the "glandes à mucosité" of *Urochæta*.

Following upon the pharynx is the narrow œsophagus, which presently widens out in the eighth and ninth segments to form the gizzard, an organ that is found in all Earthworms except in *Pontodrilus*. The structure of the gizzard is in no way remarkable: it is surrounded by a very thick circular muscular coat, outside which is a delicate layer of longitudinal fibres; a few radiating muscles pass through the circular layer; it is lined by a tall columnar epithelium which secretes a very thick cuticle. The position of the gizzard, placed as it is along the course of the œsophagus, is the same that has been found to occur in all Intra- and Postclitellian Earthworms; in *Lumbricus* alone the gizzard marks the posterior termination of the œsophagus.

Behind the gizzard the œsophagus is rather wider than it is in front, and becomes extremely vascular; even in the spirit-preserved specimens which I have dissected, this region of the œsophagus is conspicuous from the abundant presence of blood-vessels, which form two systems:—(1) a superficial plexus, (2) an internal blood-lacuna which surrounds the gut, lying just within the lining epithelium.

In relation to the œsophagus are developed certain peculiar glands, which appear to correspond to the "calciferous glands" of *Lumbricus*.

In the common Earthworm (*Lumbricus*) the hinder region of the œsophagus is furnished with three pairs of lateral diverticula, which have been long known as the calciferous glands, or glands of Morren; of these the anterior pair are the larger. The structure of these glands has been described by Claparède[2]; in the region where they are found the œsophagus is extremely vascular, and consists of a number of radiately arranged glands or follicles divided by septa of connective tissue enclosing a blood-space. The calciferous gland itself is merely a diverticulum of the œsophagus, and is made up of exactly the same structures, only the follicles are deeper. Claparède states that he has never observed the formation of the calcareous particles secreted by these glands within the gland-substance.

In the genus *Urochæta*, Perrier[3] has described three pairs of similar glands, which are of very much larger size than in *Lumbricus*, but appear to present a more or less similar structure.

[1] *Loc. cit.* p. 29. [2] Zeitschr. f. wiss. Zool. Bd. xix. 1869, p. 602.
[3] Arch. d. Zool. Exp. t. iv.

There are certain glandular structures present in all three species of *Acanthodrilus*, which appear to represent these three calciferous glands of *Lumbricus* and *Urochæta*.

In *A. novæ zelandiæ* and in *A. dissimilis*, in the thirteenth segment the œsophagus undergoes a remarkable alteration in its character; it apparently widens considerably (Pl. LII. fig. 2, *gl*), and this saccular dilatation, when cut open, presents an appearance somewhat like that of a ruminant's stomach; a number of leaf-like folds project into the lumen of the tube. In the following segment the œsophagus is again somewhat dilated (fig. 2, *gl′*) before it returns to its original calibre; a series of transverse sections (Pl. LII. fig. 1) shows that these supposed dilatations to the œsophagus are distinct glands, which are separated from its walls anteriorly and posteriorly; in the middle their lumen is directly continuous with the lumen of the œsophagus without the intervention of a duct. The glands of either side are quite separate from each other; on the dorsal side of the œsophagus the two glands of each pair nearly come into contact, being separated only by a very narrow space, in which the dorsal vessel and the short mesentery connecting it with the gut lie. Ventrally the glands of each pair are widely separate.

The posterior pair of glands differ from the anterior in being trilobate. Each is divided by horizontal furrows, coinciding with the long axis of the body, into three separate lobes. The anterior pair of glands are unilobate, and considerably smaller than the posterior pair; otherwise their structure is the same. The accompanying drawing (Pl. LII. fig. 1) will give a correct notion of the appearance of the posterior pair of glands under a low power.

In *Acanthodrilus multiporus* there are apparently only a single pair of calciferous glands present (Pl. LII. fig. 3, *gl*), the specialization of which has gone a step further; instead of being little more than mere dilatations of the œsophagus, the calciferous glands of this species are quite separate from the œsophagus, communicating with it only by a short narrow duct. The structure of these glands appears to be identical in all three species.

They consist of numerous lamellæ concentrically arranged, reaching from the walls of the gland to its opening into the œsophagus; these lamellæ are, however, of different lengths, as will be apparent from the drawing (Plate LII. fig 1). In *Lumbricus* Claparède figures the lamellæ of equal lengths. The lamellæ consist of a core of connective tissue, in which is a large blood-lacuna, and on either side a row of cells which secrete the calcareous corpuscles, and with which they are filled, as also is the lumen of the gland. Claparède did not succeed in observing the calcareous corpuscles in course of formation, although he found the lumen of the gland and the œsophagus full of them.

The structure of the calciferous glands of *Urochæta*, judging from M. Perrier's description and figures, appears to be different; instead of a series of lamellæ, there appear to be a quantity of closely-packed cæcal tubes.

The folded structure of the calciferous glands of *Acanthodrilus* is simply an exaggeration of the structure of the œsophagus, which is traversed by numerous longitudinal folds.

The œsophagus passes gradually into the *intestine*, which is distinguished by its greater calibre, and extends to the anus without any variation in its character. The intestinal epithelium is ciliated, and the ciliation is continued forwards into the œsophagus as far as the calciferous glands; in front of the calciferous glands the œsophagus does not appear to be ciliated.

The intestine is unprovided with cæca or with glands of any description.

The *typhlosole* has a characteristic form, and serves to distinguish *A. multiporus* on the one hand from *A. novæ zelandiæ*, and *A. dissimilis* on the other. In the two latter species the typhlosole, on a superficial inspection of the intestine, appeared to be absent; in transverse sections it may be seen to be present, though extremely rudimentary. On the upper side of the intestine, just below the dorsal blood-vessel, the muscular coat is prolonged downwards for a short distance into the lumen of the gut, and the lining epithelium covers the projection, which only measures $\frac{1}{10}$ of the lumen of the intestine; in certain regions the typhlosole was a little more complicated, being bifurcate at its extremity, indicating an approach to the structure of the typhlosole of *A. multiporus*.

In this species, on the dorsal side of the intestine, and projecting into its lumen, is a very conspicuous typhlosole. The typhlosole is well developed throughout the greater part of the intestine, but gradually decreases, and finally disappears in the hindermost region of the gut. In the largest example of this species, measuring about 11 inches in length, the region of the intestine devoid of typhlosole was rather more than one inch in length. The typhlosole projects into the lumen of the intestine in the middle of the body, where it is well developed, for a space of about half of its diameter; more exact measurements show that the extreme length of the typhlosole is to the circumference of the intestine as 6 : 30. In transverse sections it may be seen that the typhlosole is not a single fold; it consists in fact of three folds, two lateral and one median, which unite together to form a single fold attached to the wall of the gut. The lateral folds are subequal, and considerably deeper than the median fold; their vertical diameter is from two to three times that of the median fold. The typhlosole arises from the dorsal wall of the gut at a point exactly between the two dorsal vessels. Its structure is exhibited in Plate LIII. fig. 1. It is an outgrowth of the epithelial wall of the intestine, surrounding a blood-sinus. The cells are tall and columnar, and resemble in every particular the lining epithelium of the intestine. Between the cells which form the opposite walls of each of the three folds is a continuous blood-sinus, which widens out at the cæcal extremity of both the median and the lateral folds, and also above the point of junction of the three folds, where it forms a wide reservoir, cup-shaped in transverse section. I did not succeed in tracing the blood-sinuses of the typhlosole into connection with any similar blood-sinus in the walls of the intestine itself; but I have little doubt, from the analogy of *Acanthodrilus novæ zelandiæ*, that such a sinus exists. A delicate layer of transverse muscles, continued into the typhlosole from the intestinal walls, enclosed the blood-plexus.

§ *Vascular System.*

Concerning the vascular system of *Acanthodrilus* I have but few remarks to offer; to study the circulation thoroughly it is requisite to have living specimens.

In a short paper in the 'Proceedings of the Royal Physical Society'[1] I have referred to the double condition of the dorsal vessel in two of these species, so that I need do no more than briefly recapitulate the main points of that paper, which are as follows:—In the genera *Megascolex* and *Microchæta* the anterior section of the dorsal vessel is formed of two separate tubes, which become united at the points where they traverse the mesenteries. In *Acanthodrilus novæ zelandiæ* the separation of the dorsal vessels into two distinct tubes has gone a step further (Pl. LIII. fig. 6): the whole of the vessel except the anterior extremity lying upon the pharynx is divided into two separate tubes which only unite at each mesentery. In *A. dissimilis*, which agrees so closely in external as well as in anatomical characters with *A. novæ zelandiæ*, the dorsal vessel is a single tube, and appears to be always so. It is not possible, however, to use this retention of an embryonic character in *A. novæ zelandiæ*, which is analogous to the partial retention of the left aortic arch in the Raptores among birds, to distinguish the species absolutely from *A. dissimilis*, for in one example of the former species the dorsal vessel was single.

In *A. multiporus* the primitive double condition of the dorsal vessel is more complete still. In this species the dorsal vessel is composed of two tubes which run from end to end of the body and are not fused at the mesenteries.

The dorsal vessel is connected with the ventral (supra-nervian) by a number of transverse trunks, the last pair of which are situated in the thirteenth segment. The last four pairs arise both from the dorsal and supra-intestinal trunks, as Perrier has recorded in *Pontodrilus* and other genera.

The supra-intestinal trunk lies on the surface of the alimentary canal, and is concerned with the supply of the intestinal blood-plexus. In one specimen of *A. novæ zelandiæ* this vessel was double; beneath the œsophagus is another longitudinal blood-vessel, which I did not observe in the intestinal region.

The supra-nervian trunk is connected with the median ventral line of the intestine by a mesentery; and in the œsophageal region the dorsal vessel, which here lies some way above the alimentary tract, is connected with it, as elsewhere, by a similar mesentery, or two, one for each dorsal vessel where it is double.

In the thirteenth to about the nineteenth segment is a lateral vessel on either side; it appears to arise from a transverse heart.

[1] 1884–85, p. 424.

§ *Nephridia.*

Hardly anything is known about the nephridia in the genus *Acanthodrilus.* Perrier does not refer to their presence in his description either of the genus[1] or of the three species examined by him. A statement that the apertures of these glands are placed above the ventral pair of setæ[2] implies, however, their existence. Dr. Horst[3] failed to find any nephridia at all in *A. schlegelii*; and in *A. büttikoferii* they appear to be represented solely by a tufted organ in the anterior part of the body, attached to the pharynx, which is probably identical with the "salivary" gland of *A. multiporus,* to which I have already referred. They are present in *A. kerguelenensis* and in *A. capensis.*

In all the three species described in the present communication nephridia are found; in *A. multiporus* I have already[4] described the structure and distribution of the nephridia. This species is apparently unique among Earthworms in possessing a single nephridium to each of the eight setæ, the duct of which opens in close proximity to the seta by a single orifice in the posterior part of the body; in the anterior part of the body the duct of each nephridium branches and opens by a multitude of orifices.

A. novæ zelandiæ and *A. dissimilis,* the nephridia are remarkable in that they alternate in position from segment to segment of the body. It is a general rule among Earthworms, possessing only a single pair of nephridia in each segment of the body, that the position of the external apertures of these is constant. In *Lumbricus* the nephridia are related to the ventral pair of setæ, near to which they open, and the same is the case with *Eudrilus* and several other genera. Perrier discovered that in other genera (e. g. *Rhinodrilus*) the nephridia bore a similar relation to the dorsal pair of setæ or to one of these setæ, if the two had become separated, as is so often the case. These facts led M. Perrier to support Prof. Lankester's hypothesis of the typical presence of two series of nephridia in Earthworms corresponding to the two series of pairs of setæ.

The characters of the genus *Plutellus* appeared to be entirely confirmatory of this hypothesis. In this Earthworm the setæ are disposed in eight longitudinal rows of a single seta each, and the external orifices of the nephridia alternate in position from segment to segment, sometimes being situated near to one of the two dorsal setæ, sometimes near to one of the ventral setæ. I have elsewhere pointed out that these facts really indicate the partial persistence of four series of nephridia[5] corresponding to the four rows of setæ, and entered to some extent into the questions raised by Prof. Lankester's hypothesis, so that I need not recall the matter.

In *A. novæ zelandiæ* and *dissimilis,* where, as has already been

[1] Nouv. Arch. &c. p. 85.

[2] *Loc. cit.* p. 162.

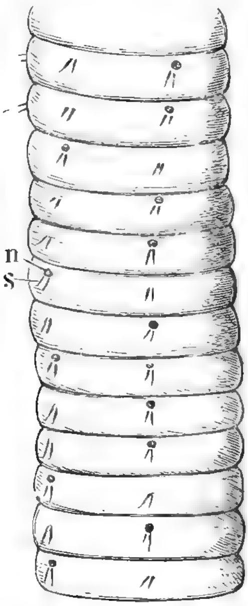
[3] Notes from Leyden Museum, vol. vi. pp. 105, 107.

[4] Proc. Roy. Soc. no. 238, 1885, p. 459. See also a forthcoming paper in Ann. Sci. Nat.

[5] Proc. Roy. Soc. *loc. cit.*

mentioned, the setæ are in four series of pairs, the nephridia similarly alternate in position from segment to segment (woodcut, fig. 2). There does not, however, appear to be any regularity in this alternation: sometimes the nephridia of five or six consecutive segments open by the same series of setæ on both sides of the body. In other segments there is an asymmetry of the nephridia of the two sides of the body: for example, the left-hand gland may open by the dorsal, while the right-hand gland opens by the ventral pair of setæ; occasionally

Fig. 2.



Acanthodrilus novæ zelandiæ.—A portion of the body viewed from the side. *n*, nephridial pores; *s*, setæ of ventral pair.

there is a regular alternation coupled with absolute symmetry in the position of the nephridial pores. Moreover, no two individuals of either species that I examined were exactly alike in these respects; and it was impossible to distinguish one species from the other by the position of the nephridial pores; occasionally the nephridia, one or both, were found to coincide at the same series of setæ as the male and female genital ducts, but in no case did I observe a similar coincidence of nephridium and spermatheca.

Another point of interest in connection with the nephridia of these two species has not been recorded by Perrier in *Plutellus*: the two series of nephridia, dorsal and ventral, show other indications besides the varying position of their apertures of being the vestiges of two complete series; in every instance *it was found possible to distinguish the nephridia of each series by morphological differences.* In all the nephridia the muscular portion which forms the distal extremity of the gland, and which may be regarded as its duct, is hypertrophied compared to what it is in *Lumbricus*. In the dorsal series of nephridia this muscular duct is extremely long, and before perforating the body-wall it gives off a minute cæcum which extends beyond (dorsal to) the external orifice; in the most anterior segments of the body this diverticulum is not present (Plate LII. fig. 4). In the ventral series of nephridia the terminal muscular duct is very short, but it is connected with, and opens into, a large sac-like diverticulum (Plate LII. fig. 5) about equal in length to the muscular duct of the dorsal nephridia, and which lies, not beyond the setæ, but on the same side of them as the nephridium itself.

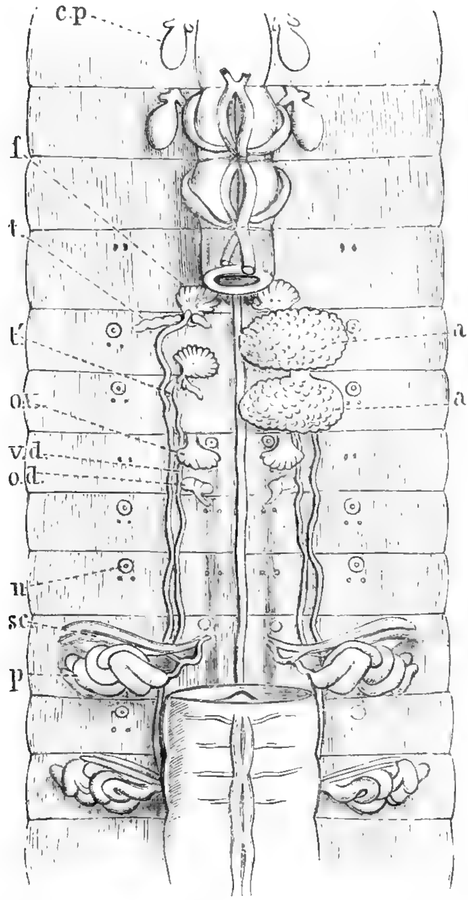
The differences above indicated are absolutely distinctive of the two series of nephridia: wherever these organs opened by the ventral pair of setæ they were found to have a large diverticulum developed at the expense of the terminal duct, which is in consequence short; wherever they opened by the dorsal pair of setæ, the muscular duct was long, the cæcum short, projecting on to the further side of the setæ.

§ *Generative Apparatus.*

The *male generative apparatus* of *A. novæ zelandiæ* as well as the other two species consists of two pairs of testes, two pairs of vasa deferentia, with which are connected a prostatic gland and a number of peculiarly modified setæ. The position of the several glands and their ducts are shown in the accompanying drawing (fig. 3, p. 825).

The *testes* are situated in segments 11 and 12, and have the form of racemose glands composed of a number of spherical acini. When the body is opened the testes are seen to extend above the dorsal vessel but are not united together; the testis of each side is free from its fellow; they are attached by a stalk to the anterior mesentery of the segment which they occupy; in the tenth and eleventh segments are the funnels of the vasa deferentia; the pair of funnels of each segment are close together on either side of the median line and just above the nerve-cord; the margins of the funnel are extremely folded and complicated, which renders their detection a matter of great ease; it is rather curious to find that the anterior pair of funnels are situated in the segment in front of that which contains the anterior pair of testes, but a similar condition has been recorded in other Earthworms. It must be noted that the funnels of the vasa deferentia are entirely independent of the testes; they project freely into the interior of their respective segments, and there is no possibility of regarding the testes as an expanded portion of the true funnel of the vasa deferentia. The testes therefore in this Earthworm are the real sexual glands and are not the homologues of the so-called "testes" of *Lumbricus*, which are merely the dilated ends of the vas-deferens funnels. As is well known, the real testes of the common Earthworm are four minute bodies, which discharge their contents into the sac-like termination of the vasa deferentia, and seem to disappear when the animal is mature; it is these bodies that are homologous with what I have described as the testes of *Acanthodrilus*. The structure of the male generative organs in *Lumbricus* appear therefore to be exceptional, since it is almost the general rule among Earthworms for the testes to be large

Fig. 3.



Acanthodrilus dissimilis.—Dissection of genital region.

c.p, Copulatory pouch; *a*, testes; *f*, funnels of vasa deferentia; *v.d*, vas deferens; *ov*, ovary; *o.d*, oviduct; *n*, opening of nephridia; *t*, *t′*, peculiar glands homologous (?) with ovaries; *p*, prostate; *sc*, sac containing penial setæ. A portion of the œsophagus, and the testes of left side have been removed.

glands, not in the least comparable in size to the ovaries. The fact that the true testes of *Lumbricus* are approximately of the same size as the ovaries, might lead any one to doubt on *à priori* grounds of the correctness of my description; but the racemose character of the testes in *Acanthodrilus*, which I have found more marked in

Megascolex, and which undoubtedly occurs in other Earthworms, coupled with their absolute independence of the vas-deferens funnels, is, I think, sufficient to show that my determination is correct.

The vasa deferentia, instead of uniting to form a single tube, as appears to be the case in the majority of Earthworms, remain obviously distinct from each other for the whole of their course; they pass down close to the ventral pair of setæ, but to the outside of them, and in certain regions, at any rate, are not very firmly fixed to the body-wall; their walls are supplied with abundant blood-capillaries. On referring to Perrier's description of the anatomy of *Acanthodrilus*, I find that he figures the vasa deferentia in *A. ungulatus*[1] as being composed of two widely separated tubes.

The *prostate glands* are two pairs, each connected with one of the four male genital apertures; each consists of a thick-walled glandular tube variously coiled upon itself, and terminating in a narrow muscular duct which has a nacreous glitter. In *A. multiporus* (Pl. LIII. fig. 2) the mesenteries in the neighbourhood of the prostates are arranged in a somewhat radiating fashion as bands of nacreous-looking fibres, which are attached at one extremity to the ventral body-wall, close to the apertures of the prostate; they perhaps serve as special "cremaster" muscles. With each of the male generative apertures is connected a thin-walled muscular sac containing a number of long penial setæ, hooked at their extremity, but not ornamented in the way that is often found in *Acanthodrilus*. There is therefore nothing remarkable in the male generative system of this species, except in the fact that the apertures are situated within the clitellum instead of behind it; it is, with the exception of this relation of its aperture to the clitellum, precisely similar to the male generative system of other *Acanthodrili*, even to the numbers of the segments on which the vasa deferentia open. If systematists are unwilling to include this species within the genus *Acanthodrilus*, it cannot, at any rate, be placed far from it, certainly not in a distinct group.

In describing the external characters of these worms, it should have been mentioned that the male apertures are situated upon the summits of conspicuous papillæ; transverse sections through this region of the body-wall show that the papillæ are the result of the more elongated form of the epidermic cell surrounding the apertures of the generative ducts; the cells which cover the papillæ are from three to four times the length of the cells that are found elsewhere, but are similar to them in their structural characters. In *A. dissimilis* the duct of the prostate gland comes into close relation with the genital setæ; the latter are of course homologous with the ordinary locomotor setæ, and simply replace them upon the genital segments.

Each of the two genital setæ corresponding to each genital aperture is contained in a separate sac, which is lined by a continuation of the epidermis, and communicates with the exterior by a separate orifice. There are of course numerous accessory setæ, which

[1] *Loc. cit.* pl. ii. fig. 18.

are equivalent to the "soies de remplacement" of the locomotor setæ; these, however, are contained within the body-cavity and do not protrude on to the exterior. It is important to notice that the genital setæ, although different in appearance from the ordinary locomotor setæ, do not differ in their disposition; and, moreover, the aperture of the conjoined vas deferens and prostate duct has a relation to the setæ precisely similar to that which has already been referred to in the case of the nephridial aperture and the locomotor setæ (see p. 822). The apertures of the vasa deferentia, like those of the nephridia, correspond in position to the outermost setæ of the pair.

§ *Female Generative Organs.*

In *Acanthodrilus novæ zelandiæ* and *A. dissimilis* the ovaries are to be found in the 13th segment, *i. e.* next to that which contains the posterior pair of testes; they are attached to the anterior mesentery of this segment close to the middle line. The ovaries are of a very peculiar form; instead of being round, or, rather, pear-shaped as in *Lumbricus,* they present the appearance of a flattened circular disk, much folded and plicated; their resemblance indeed to a vas-deferens funnel is so striking, that I mistook them at first for such a structure, until a microscopical examination revealed their true nature. I find a figure by M. Perrier of the ovary of *Perichæta houlleti*[1], which shows a great resemblance to the ovaries of this *Acanthodrilus.* It is interesting to note the different positions which the ovaries may occupy in Earthworms: in *Lumbricus* they are situated on the anterior wall of the segment in which they are found, and, as in *Acanthodrilus,* this is the 13th segment of the body; in *Perichæta* and *Microchæta* the ovaries are found in the same segment of the body, but upon the posterior mesentery; in *Acanthodrilus multiporus* I have to record the position of the ovaries in the same segment, but attached to the anterior margin of the oviduct-funnel and apparently to the ventral body-wall, between the two mesenteries which enclose the segment.

In *Acanthodrilus dissimilis,* also in *A. novæ zelandiæ,* the oviducts open separately in front of the ventral pair of setæ of each side; a series of transverse sections through this region show that the apertures bear a particular relation to the outermost of these two setæ. There is nothing remarkable in the structure of the oviducts. The oviducts of *A. multiporus* open by the innermost of the two ventral setæ, so that the position is slightly different. In all three species there are a series of peculiar glands, two pairs situated in the 11th and 12th segments. The position of these structures in *A. dissimilis* and *A. novæ zelandiæ* is shown in the drawing (woodcut, fig. 3) which illustrates the generative region of *A. dissimilis.* The general appearance of these glands is not unlike that of the ovaries; they are somewhat rosette-shaped, being formed of a much plicated disk, attached by a narrow pedicle to the anterior mesentery, and depending freely into the interior of the segment; the general

[1] Nouv. Arch. &c. *loc. cit.* pl. iii. fig. 60.

shape of these glands may be understood from the same drawing. From transverse sections through the body, it could be seen that these glands are closely adjacent to the terminal portion of the vasa deferentia (Plate LII. fig. 9) just before they perforate the mesentery.

These glands possibly correspond to a pair of somewhat similar glands described and figured by Perrier in *Pontodrilus* [1]; they are also possibly to be compared to two glandular masses which I have described myself in *Megascolex* [1].

The position of these glands exactly corresponds to that of the ovaries, attached as they are to the anterior mesentery of their segment close to the middle ventral line; their structure exactly resembles that of the ovaries in those regions where the fully formed ova are not found. A more positive proof that these glands are the morphological equivalents of ovaria is the fact that in one example of *A. dissimilis*, that I have studied, by means of transverse sections, *the posterior right-hand gland contained abundant ova, which resembled in every detail the ova produced by the true ovaries* which lie in the succeeding segment. Beyond this single fact, which may be an abnormality, but, like other abnormalities, serves as clue to a morphological comparison, I have no evidence to offer as to the function of these structures.

The fact that there are frequently more than a single pair of testes in Earthworms—there are two pairs for example in the present species—renders it more probable still that the comparison which I have instituted is a correct one. The multiplication of ovaries, as well as of testes, naturally recalls the condition met with in hermaphrodite Polychæta. These species of *Acanthodrilus* appear, in fact, to have preserved more completely than any other Earthworms, the anatomy of which is known, the primitive condition of the generative organs.

There is no Oligochætous Annelid in which more than a single pair of ovaries are known with certainty to occur; *Euclipidrilus*, according to Eisen [2], possesses three pairs of ovaries; and in *Chætogaster limnæi*, Lankester [3] has described two pairs which are not mature at the same time. Vejdovsky [4], however, states that he has never succeeded in finding the second pair in *Ch. limnæi*, and is of opinion that Eisen has mistaken other organs for the additional pairs of ovaries in *Euclipidrilus*.

The above suggestion as to the homologies of these anterior glands is also borne out by their relations in the third of the three species, viz. *A. multiporus*. It has already been mentioned that the ovaries of this *Acanthodrilus*, instead of being attached to the anterior wall of the 13th segment, are attached to its posterior wall in close connection with the oviduct. There is a similar change in position of the glandular bodies, which come to lie beneath the funnels of the

[1] *Loc. cit.* pl. xiv. fig. 9, pl. xvii. fig. 37, and *loc. cit.* p. 504.
[2] Roy. Soc. of Sciences, Upsala, 1881.
[3] Quart. Journ. Micr. Sci. vol. ix. new ser. 1869.
[4] System und Morphologie der Oligochæten. Prag, 1884, p. 145.

vasa deferentia, and are consequently not obvious on a dissection of the worm, since they are largely concealed by the funnels and are only evident on raising the latter. In transverse sections (Plate LII. fig. 9) they are very conspicuous, and although attached by a pedicle to the sides of the funnel, their tissue is unmistakably different from the elongated ciliated cells which compose the latter, and is absolutely similar to that of the homologous glands in the other species; the change in the position of the glands naturally moves them a segment further forward than in *A. dissimilis*, and there is consequently a segment lying between the ovaries and the posterior pair of glands.

Copulatory Pouches.—Copulatory pouches (spermathecæ) are present in all three species, and have a characteristic form which serves to discriminate the species. In all there are two pairs which are situated in the 7th and 8th segments, and open on to the exterior in the furrow which separates each of the segments from the preceding one, in front of the ventral pair of setæ; in *A. multiporus* the apertures of the copulatory pouches are related to the outermost of the two ventral setæ. The copulatory pouches are large oval sacs, communicating with the exterior by a short, thick-walled duct. In *A. multiporus* the pouches appeared to be without diverticula; in *A. dissimilis* each of the copulatory pouches (Plate LIII. fig. 9) is furnished with a pair of long diverticula opening into the duct of the pouch, one on either side. The disposition of the diverticula varied in different specimens: in one specimen the diverticula were contained in the same segment as the pouch, with the exception of one of the two diverticula of the posterior left-hand pouch, which passed through the mesentery and projected into the 8th segment; in another example both diverticula of the two anterior and one of the posterior pouches, in the segments anterior to those in which the pouches themselves were situated. In *A. novæ zelandiæ* the terminal portion of the duct of the copulatory pouch is beset with a great number of small diverticula arranged in the form of a rosette (Plate LIII. figs. 3 and 8); as in *A. dissimilis*, the diverticula sometimes seem to lie in the same segment as the copulatory pouch itself, sometimes in the segment in front.

In *Acanthodrilus dissimilis* the structure of the copulatory pouches and of their diverticula undergo certain changes during the life of the animal, which are evidently connected with the process of fecundation.

In individuals, which I take to be not completely mature, the copulatory pouch has the structure illustrated in Plate LII. fig. 8; within the muscular layers, which are thin and abundantly vascular, is a layer of tall, columnar, nucleated cells; on a superficial view these cells present the appearance indicated in fig. 7 of the same Plate; they are extremely narrow and somewhat hexagonal in contour; the epithelial lining of the copulatory pouch is thrown into folds which are often very regular in their arrangement (Plate LIII. fig. 7), but only consist of a single layer of cells.

In another individual the structure of the epithelium of the copulatory pouch is somewhat more complicated: a small portion of this epithelium is displayed in Plate LII. fig. 6. The columnar cells are still present and of the same general appearance, but between them are a number of large, oval, granular cells (*a*), which are considerably shorter and do not reach the surface; towards the external aperture of the pouch the granular cells disappear, and the epithelium gradually passes into the outer epidermis without any distinct break.

These changes in the structure of the copulatory pouch are accompanied by changes in the structure of its diverticula. Before describing these, I should mention that the copulatory pouches were invariably empty of spermatozoa; in no case did I find the least traces of spermatozoa in the copulatory pouch itself; on the other hand, the diverticula were as invariably *full* of spermatozoa compacted together in a way that will now be described.

In the first-mentioned individual, in which the copulatory pouches present the more simple structure, the accessory pouches are also comparatively simple in their structure. The epithelium consists of tall columnar nucleated cells, quite similar to those which form the inner lining of the copulatory pouch; the epithelial layer is thrown into folds, and in the distal portion of the chamber these folds meet and divide the cavity into a number of smaller cavities; of the copulatory pouch itself, on the other hand, the cavity is never thus subdivided. Here and there the epithelial cells are replaced by largish oval spaces, apparently filled with a fluid substance, and which are probably due to the degeneration of cells; in many of these were imbedded packets of spermatozoa arranged in longitudinal bundles and closely cemented together.

In the more mature individual the structure of the diverticula was almost completely lost: it appeared to form a completely solid mass, without any trace of a lumen or only just the faintest trace near to its external aperture. The interior of the pouch consists of masses of granular matter of various sizes and shapes (see Plate LIII. figs. 10 and 11), in which were imbedded bundles of spermatozoa; trabeculæ of a tissue, which may represent the degenerated epithelium, form a complete network, and separate off from each other the granular masses containing the spermatozoa.

This condition is obviously brought about by a still further activity of the epithelium of the diverticula, of which there were indications in the first stage.

It appears to me therefore that in this species the copulatory pouch itself has little or no share in the phenomena of reproduction; the spermatozoa, perhaps cemented together in bundles by the secretion of the prostate glands, are transferred direct to the diverticula of the copulatory pouches, where they undergo further change, which perhaps results in the formation of a spermatophore; I have not, however, succeeded in finding any spermatophores.

The main fact to which I wish to call attention, is that the *diverticula* of the copulatory pouch, and not the pouch itself, have the chief share in the process of fecundation.

In *A. novæ zelandiæ* I am not able to give any details of the structure of the diverticula, which, as already mentioned, are extremely small, or to compare their structure with that of the main pouch; but I am able to state, as a fact, that the spermatozoa were contained within the diverticula and not in the pouch.

The foregoing considerations appear to me to indicate that the diverticula of the copulatory pouches are not merely "diverticula," serving to increase the storage room, but perform some definite function in relation to the spermatozoa, which function is not shared in by the copulatory pouch itself; the very general prevalence of diverticula to the copulatory pouch among Earthworms is an additional piece of evidence that these structures have some importance *per se*. In some species of *Perichæta* these supplementary pouches attain to an extraordinary degree of complication, and are quite divorced from the main copulatory pouch, opening on to the exterior by separate orifices. In *Microchæta* the copulatory pouch itself has apparently disappeared [1], and only the supplementary pouches remain. *Microchæta* is therefore at one end of the series, and *Lumbricus*, where there are no diverticula at all, at the other.

I have searched the literature of the subject in order to find out how far the statement that I have just made with regard to the copulatory pouches are in harmony with the observations of other writers. Perrier mentions that in *Urochæta* he never found spermatozoa in the copulatory pouches; but the observation is not of much value, as Perrier himself points out, since the examples of the worm were, without exception, in a condition of incomplete maturity. I can find no other positive statement except in Huxley's 'Anatomy of Invertebrated Animals,' where it is mentioned that the pouches are filled with spermatozoa when copulation takes place. It is possible that this does actually take place even in *Acanthodrilus dissimilis*, and that the spermatozoa are rapidly got rid of, and transferred to the diverticula, where they are compacted into masses. This is at any rate in accordance with the facts which I have been able to describe. Dr. Horst[2] mentions that in *Perichæta sumatrana* the diverticula of the copulatory pouches contained "an orange-coloured substance which, highly magnified, appeared to be a mass . . . . . . of spermatozoa."

In briefly running over the specific characters of the third species treated of in the present paper, viz. *A. multiporus*, I mentioned that the copulatory pouches appeared to be like those of *Lumbricus*, simple spherical sacs without diverticula. This statement requires some correction; on making a series of transverse sections through the copulatory pouch and the body-wall in its immediate neighbourhood, I detected a number of minute diverticula opening into the duct of the copulatory pouch just before its external aperture, and imbedded in the muscular layers of the body-wall. The diverticula, as in the other instances, contained abundant spermatozoa, which were entirely absent from the interior of the copulatory pouch itself; the latter contained a granular mass which appeared to be the

[1] Proc. Roy. Soc. no. 238, 1885, p. 462.
[2] Notes from Leyden Museum, vol. v. p. 190.

result of a coagulation by the hardening reagent of a fluid or semi-fluid substance; *in this were imbedded a vast number of spherical concretions.* The presence of these latter evidently suggests that the copulatory pouch itself may act as an excretory organ; and in view of the supposed homologies between the copulatory pouch and the nephridia, this fact is of some importance.

I carefully searched for concretions in the copulatory pouches of the other species, but did not succeed in finding any.

Vejdovsky, in his recently published 'System und Morphologie der Oligochæten,' has figured crystals and one concretionary body in the copulatory pouch of *Stylaria*[1], but I am unacquainted with any other facts comparable to those which have just been stated.

EXPLANATION OF PLATES.

Plate LII.

Fig. 1. Transverse section through œsophageal region of *Acanthodrilus dissimilis.* *œs,* Œsophagus; *gl,* calciferous glands; *d.v,* dorsal vessel; *v.v,* ventral vessel; *n,* nerve-cord.
2. Œsophagus and calciferous glands (*gl, gl'*) of *A. dissimilis.*
3. Œsophagus and calciferous glands (*gl*) of *A. multiporus.*
4. Dorsal nephridium of *A. novæ zelandiæ.*
5. Ventral nephridium of *A. novæ zelandiæ.*
6. Epithelium of copulatory pouch of *A. dissimilis.* *a,* Glandular cells.
7. Superficial view of same epithelium.
8. Epithelium of copulatory pouch of immature individual of same species.
9. Glandular body (*gl*) attached to vas deferens (*v.d.*) of *A. dissimilis.*

Plate LIII.

Fig. 1. Typhlosole (transverse section) of *A. multiporus.*
2. Prostates (*pr*) and modified mesenteries (*m*) of *A. multiporus.*
3. Copulatory pouches (*c.p*) and diverticula (*c.p'*) of *A. novæ zelandiæ.* *n,* nephridia.
4. Anterior end of body of *A. multiporus.* *c,* "Brain;" *d.v,* dorsal vessel; *n,* nerve-cord; *gl,* salivary gland; *d,* its duct; *ph,* pharynx.
5. Opening of ducts of salivary glands (*o*) within buccal cavity.
6. Portion of intestine, and paired dorsal vessel of *A. novæ zelandiæ.*
7. Transverse section of copulatory pouch of *A. dissimilis.*
8. Copulatory pouch of *A. novæ zelandiæ.*
9. Copulatory pouch of *A. dissimilis.*
10. Portion of diverticulum of copulatory pouch of *A. dissimilis* in transverse section, slightly magnified to show the bundles of spermatozoa (*gp*) imbedded in granular substance.
11. Transverse section of diverticulum of same species, less magnified. The bundles of spermatozoa which have taken up the staining fluid more than the surrounding tissue, are indicated as black masses.

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[1] Pl. iv. fig. 11.

November 17, 1885.

Prof. W. H. Flower, LL.D., F.R.S., President, in the Chair.

The Secretary made the following report on the additions to the Society's Menagerie during October 1885:—

The total number of registered additions to the Society's Menagerie during the month of October was 131, of which 102 were by presentation, 11 by purchase, 1 by birth, 3 were received in exchange, and 14 on deposit. The total number of departures during the same period, by death and removals, was 84.

Amongst these special attention may be called to:—

1. A collection of North-American Reptiles, presented by F. J. Thompson, Esq., amongst which are examples of the Alleghany Snake, *Coluber alleghaniensis*, new to the Society's Collection.

2. Two collections of Reptiles from the Cape Colony, presented by the Rev. G. H. R. Fisk, C.M.Z.S., amongst which is an example of a species of Elaps (*Elaps hygiæ*) from Uitenhage, Cape Colony, new to the Collection.

3. An example of the Black-eyebrowed Albatross (*Diomedea melanophrys*), obtained in False Bay, Cape Colony, and presented to the Society by W. Ayshford Sanford, Esq., F.Z.S.

Along with the Reptiles Mr. Fisk has sent us for the Insect House two curious Millipedes, believed to be referable to *Spirostreptus annulipes*, which I have now the pleasure of exhibiting to the Meeting.

In reference to the question as to the correct locality of *Chamæleo calcarifer* (suprà, p. 717), the following extract was read from a letter addressed to the Secretary by Major S. W. Yerbury, dated July 12, 1885:—

"In answer to your question about the Chameleon, there is no doubt of its locality, as I caught it myself, and I fancy that it is not uncommon in the neighbourhood of Aden. At any rate I met with it myself three times in three different places. On reference to my note-book I find the dates, localities, &c. to be as under:—

"No. 1. Shaik Othman, 1st September, 1883. A large light green Chameleon with yellow-brown markings, 15 inches long, caught on a lime-bush in the garden of Hassan Ali's bungalow. After death the colour turned to dull grey. An Arab carpenter at work in the bungalow, who could talk a little Hindustani, told me that this Chameleon was to be found at the tanks in Aden, and that it was common in the jungle round; he had an extraordinary story about its climbing up the legs of the cows and goats and sucking their udders.

"No. 2. East branch Toban river, beyond Isfian, 29th December, 1884, I caught a large green Chameleon on a bush with pink flowers.

"No. 3. Huswah, 15 March, 1885, I got a big Chameleon on a Salsola bush.

"No. 1 was lost; No. 2 I put in spirits and sent with some other things to the British Museum, somewhere about the 25th March last. No. 3 I kept alive for some time and eventually sent to the Society. I used to feed it on cockroaches by putting an old butterfly-net over the cage, and turning in five or six cockroaches at a time. I noticed both that it used to make some shocking bad shots at the animals and also (perhaps from confinement) that the viscid matter at the end of the tongue seemed unable at times to hold the insect. I think all three specimens were of about the same size and colour when caught. No. 3 was generally of a dark dull grey while in captivity, but got happier when I gave him a Parrot's cage and some branching stems, and hung him up in a creeper; he then sometimes assumed the green and reddish-brown markings. They had all most villanous tempers, spitting and hissing in an awful manner, and looked ferocious and alarming. I caught No. 3 by giving him the stick of my butterfly-net to hold in his feet, and then catching him by the finger and thumb of the other hand; he had the comb over one eye and part of the crest broken, but that was done before I caught him. No. 2 bit my finger, and his hard bony jaws crushed the flesh considerably, and tore the skin away when pulling him off, as he would not let go. I do not think I can tell you anything more about the habits &c. of this Lizard; but I hope these notes, such as they are, may be useful.

"I caught an example of another species of Chameleon once at Aden, I think March 30, 1884; it was about four inches long, of a dull purple-red colour. I took this also at Huswah on *Dipterygium glaucum*, and sent it in spirit to the British Museum, though not in the same bottle as the big one."

Mr. Sclater exhibited two Newts transmitted to the Society by Dr. E. B. Dickson of Constantinople, Corresponding Member, by whom they had been obtained from Brussa. Dr. Dickson gave the subjoined descriptions of the colours of the specimens when alive.

"These Salamanders when alive were covered all over with green spots and had four stripes along the underparts of their bodies. The upper and third stripe were narrow, and of a dusky-green hue; between them there was a broader stripe of a silvery-white colour and underneath them all a broader band of an orange colour, which constituted also the colour of the under surface of the belly. Eyes round: iris golden, tinged with dusky. The tail large, of a lanceolate form and dotted with dark spots; the upper ones of a lighter shade than the lower ones. These spots are separated into two horizontal rows by an extension of the silvery band which exists on the body of the animal. A high crest extends from the muzzle, in front of the eyes, to the root of the tail, and contains sixteen upright rays of a greenish hue, ending in points. The intervals between the rays, are dotted with spots. '*Semender*' is the Turkish name for these Salamanders."

Mr. Boulenger had kindly determined these specimens to be *Molge vittata* (Cat. Batr. Grad. 2nd ed. 1882, p. 13).

Mr. Sclater remarked that this species was of interest to naturalists as having been formerly supposed, through an error of the late Dr. J. E. Gray, to occur in Great Britain, and accordingly retained in the British fauna until M. Lataste (Bull. Soc. Zool. de France, 1877, p. 359) had shown the mistake. The present specimens confirmed the locality assigned to the species by M. Lataste, and, besides this, Mr. Boulenger had informed Mr. Sclater that the British Museum had recently received a specimen of this Newt from Trebizond, and that it had been found by Kessler near Poti in Transcaucasia, and at Resht in Persia.

Mr. H. E. Dresser exhibited a specimen of the American Killdeer Plover (*Ægialitis vocifera*), shot by Mr. F. Jenkinson at Tresco, Scilly, on the 14th January last, this being the second record of its occurrence in Great Britain[1]. Mr. Jenkinson had given him the following particulars of its capture, viz.:—"On Sunday, 11th January, 1885, I was walking home by the Long Pool on Tresco, and instinctively stopped to look at a favourite bit of mud and rushes at the west end. While I was looking, a bird flitted a few yards and settled on the grass between me and the mud; and as it did so it uttered a gentle half note which I felt sure belonged to no bird that I had seen before.

"It was tame enough, and remained about for three days, its return to that particular spot apparently coinciding each day with the rise of the tide. On Monday I missed it, sitting at 25 yards after a long crawl. I half hoped that the keeper, who is a better shot than I am, would go after it, so I did not disturb it much. On Tuesday I put it up unexpectedly within a yard or two of me from behind a wall where I was waiting. The chestnut tail-coverts were very distinct as it flew away, uttering cries veritably "vociferous," but very plaintive and musical. I did not fire at it on that occasion. Next day I began by shooting a Ring Dotterel by mistake; I could not see the other anywhere; the day wore on, and I had to leave next morning. It was getting quite late when, walking up to the other end of the pool, I saw, beyond a raised causeway which crosses the pool there, a bird running on the wet ground. I fired instantly and the bird just uttered one characteristic cry, which assured me that it was the one of which I was in search, and lay there dead.

"The name Killdeer Plover at once occurred to me; and next day I found a small book on American birds, and on reading the description of that species I found that it agreed with my specimen. The bird was a female in good plump condition, and quite the reverse of an exhausted straggler."

Mr. Dresser stated that the specimen, the occurrence of which had been already recorded in the 'Zoologist,' 1885, p. 113, had been handed to him by Mr. Jenkinson with a request that he would exhibit it, so that there should be no doubt as to its being referable to *Ægialitis vocifera*.

Mr. Dresser was also indebted to Mr. W. Eagle Clarke, for the

[1] For a previous record see Ibis, 1862, p. 275.

opportunity of exhibiting a specimen of *Saxicola deserti*, the second recorded British-killed example, which had been shot between the village of Easington and the hamlet of Kilusca near to Spurn Head, on the 17th of October this year. It was at once sent to Mr. Clarke, but it was tailless and so much shot that it was impossible to determine the sex by dissection. Mr. Clarke mentioned, in order to show that at the time the bird was shot there was a considerable immigration to our shores, that a few Woodcocks, numbers of Goldcrests, Robins, Wrens, and Thrushes, and a few Owls had arrived at Spurn Head on the previous night or in the early morning of the same day.

Mr. Dresser had no hesitation in referring this specimen to *Saxicola deserti* in spite of the lack of the tail, which was a distinguishing character, and it was evidently a female, as would be seen by comparison with carefully sexed specimens of the Desert Chat also on the table.

Prof. Bell exhibited a specimen of *Balanoglossus* collected by Mr. Spencer at Herm. This was stated to be the first recorded example of this Hemichordate from any part of the British seas.

The following papers were read:—

1. Notes on the Visceral Anatomy of Birds. No. 1.—On the so-called Omentum. By Frank E. Beddard, M.A., F.R.S.E., Prosector to the Society.

[Received October 1, 1885.]

All naturalists are by this time pretty well agreed upon the close affinities which birds present in their organization to reptiles; and while it is the general view that of all existing reptiles, Crocodiles are those which most nearly approach birds, it is almost equally an accepted view that of all existing birds the Struthiones present by far the greatest number of analogies to reptiles in their anatomical structure. There are undoubtedly facts in the anatomy of the Struthionidæ which appear to favour such a view; but an increased knowledge of the structure of other orders of birds has tended to show, firstly that many of the peculiarities of the Ostrich-tribe in which they are supposed to approach reptiles, are in reality correlated with the loss of flight and the consequent change in the relation of the different parts of the shoulder-girdle and so forth, or are not peculiarities at all, but crop up in other orders of birds. Secondly, reptilian characters not found in the Struthiones are found in other orders of birds, as in the palate of the Woodpeckers (Saurognathæ), which Prof. Parker considers to present some close points of resemblance to that of reptiles.

Before contributing some few additions to our information on the visceral anatomy of birds, which appear to me to still further break down the barriers between the Ratitæ and the Carinatæ in the first of these two directions, I may briefly review our knowledge upon the subject.

In his classical paper upon the 'Classification of Birds'[1] Prof. Huxley defined the Ratitæ, and pointed out the differences which separate them from the Carinatæ. Although that paper was only published in the year 1867, it is interesting to note how the progress of research has broken down so many of the barriers which at that time were supposed to separate the Ratitæ from the Carinatæ.

The peculiarities of the skull I need not refer to, since they are repeated in the Tinamous, which in so many other respects resemble the Gallinaceous birds, and therefore form an annectent group between the Ostrich-tribe and the other Carinatæ.

The shoulder-girdle has been held to be characteristic and to form a well-marked distinction between the Ratitæ and the Carinatæ; but anatomists are now agreed that the sternum, at least, is not so characteristic as it was at one time believed to be. In the first place the presence of a "keel" is invariably associated with the power of flight, or, to speak more accurately, with a great development of the pectoral muscles; thus we find a keel on the sternum of the Bat, Mole, and Pterodactyles, while it is absent in *Strigops*, the flightless parrot of New Zealand, and in *Cnemiornis*[2].

Moreover, Prof. Jeffery Parker, in a paper upon the Osteology of the New Zealand Rails[3], has given reasons for believing that the angle between the scapula and the coracoid becomes less and less as the power of flight is diminished, so that this supposed peculiarity in the shoulder-girdle of the Struthiones is merely correlated with the loss of the power of flight.

It is commonly stated that the Struthiones possess no lower larynx, and this assertion is repeated from text-book to text-book in spite of the fact that my predecessor, the late Mr. W. A. Forbes, has conclusively shown[4] that certain of the Struthiones, if not the whole group, possess a syrinx which is essentially comparable to the syrinx of the Carinatæ, and, in the case of *Rhea*, is absolutely indistinguishable from a Carinate syrinx.

Certain of the statements of Sir Richard Owen respecting the anatomy of *Apteryx* have been since controverted. Prof. Huxley has shown that the respiratory organs of this bird, though certainly differing in detail, present no essential modifications from the respiratory organs of other birds; there is no structure unrepresented in other birds present; the supposed "diaphragm" is in reality not comparable to the diaphragm of the mammalia; and even if it were, it has its exact homologue in the Carinatæ. Prof. Lankester[5] and I[6] have shown that the heart of *Apteryx* is precisely like that of any other bird.

The presence of two nails upon the hand of *Struthio*, to which Prof. Huxley has called attention, is no doubt, so far, an archaic

[1] P. Z. S. 1867, p. 415.
[2] See P. Z. S. 1873, p. 763.
[3] Trans. N.-Z. Inst. vol. xiv. p. 245.
[4] Collected Papers, p. 232.
[5] P. Z. S. 1885, p. 415.
[6] P. Z. S. 1885, pp. 188, 477.

character recalling the claw on the hand of *Archæopteryx*; but the same thing exists among the Carinatæ. Prof. Parker, in his 'Davis' Lecture delivered at the Society's Gardens on June 18th of the present year, remarked that the Swan is similarly furnished with two claws. Prof. Parker has also mentioned the fact that *Chauna* is provided with a claw upon the first and second digits of the hand[1]. Moreover, *Rhea* has only one. There is one structure, however, which does not seem to be repeated in other birds; the barbs of the feathers in the Ratitæ are disconnected and not united by barbules. It seems, however, to be within the bounds of possibility that this is an acquired character, and due more to degeneration than to the retention of an embryonic structure. In flying birds the barbs of the feathers are united, and the whole feather thus offers a greater resistance to the air, and contributes to sustaining the bird in the air—it acts in fact like a parachute; in running birds such a structure would be useless; hence it disappears and the condition characteristic of the Ostriches is arrived at.

Without pretending to have exhausted the subject, I may point out that the foregoing recapitulation of some recently acquired results, all tend to show that the Struthiones are not so isolated a class of birds as was at one time thought, and that in fact there are hardly any, if, indeed, any characters that absolutely distinguish the Struthiones from other existing birds.

In an interesting paper on the "Respiratory Organs of Apteryx" to which reference has already been made, Prof. Huxley draws attention to certain points of resemblance between Crocodiles and birds. "As in birds, the liver lies between the stomach and the pericardium, and has a peculiar peritoneal investment shut off from the great sac of the abdomen; and, as in the Ostrich, the whole circumference of the stomach is united by fibrous tissue with the parietes," &c. This passage attracted my attention, and I have endeavoured to investigate the stomach, liver, and intestines of other birds with a view of ascertaining whether the Ostrich is really more like the Crocodile than is any other bird in the disposition of its viscera. The result has been to show that the Ostrich, and for the matter of that such of the other Struthiones as I have had the opportunity of studying, are not peculiar in the disposition of their abdominal viscera. In the course of my studies I have come across other facts in the disposition of the viscera, which appear to me worth recording and which I include in the present paper because they throw some light upon the same series of facts.

Prof. W. N. Parker, in a note upon the "Respiratory Organs of *Rhea*" has incidentally pointed out that in this bird, as in the Ostrich, the abdominal viscera are separated and enclosed in three compartments of the peritoneum; the right lobe of the liver is shut off from the left lobe, and from the rest of the viscera, into a chamber by itself; a left chamber includes the left lobe of the liver and the gizzard; while the intestines lie in a third chamber situated above as well as behind these two anterior ones.

[1] P. Z. S. 1863, p. 515.

The dissection of two specimens of *Rhea americana* which have died during the course of the present year, enables me to confirm the above-mentioned statements. In this bird, however, and in the Ostrich, the two cavities which contain respectively the right liver-lobe and the left liver-lobe, together with the gizzard, are floored by a tough membrane, which, behind the gizzard, becomes superficial, and covers over the coils of the intestine; this membrane is attached laterally to the body-wall and to the "oblique" septa which form the inner boundaries of the posterior intermediate air-sacs.

In the Emu (*Dromæus*) there is a close similarity to the condition met with in *Struthio* and *Rhea.*

On opening the bird by a median incision through the abdominal parietes, and reflecting the two cut halves of the musculature, the disposition of the viscera was seen to be practically identical with that of the other Struthiones. A tough membrane covers over the posterior section of the abdominal cavity; just behind the gizzard this membrane is firmly attached to the oblique septum; posteriorly it appears to be also attached to the oblique septum, but the two structures are in reality separable, and the horizontal membrane of the abdomen is continued upwards to the middle line of the body, where it is attached firmly in the neighbourhood of the spinal column.

The right lobe of the liver, as in *Struthio* and *Rhea,* is enclosed in a separate pocket of peritoneum, and the left lobe appears to be contained within another cavity common to itself and to the gizzard; a more minute examination, however, has convinced me that the gizzard is in reality enclosed in a distinct compartment, and is firmly attached to the parietes, as Prof. Huxley has stated of the gizzard of the Ostrich. Whether this is also the case with *Rhea,* I am unable to state. Mr. Parker has said nothing of the attachment of the gizzard to the parietes, and my own notes upon the subject are unfortunately not sufficiently explicit. There is, as Prof. Huxley has shown, a close correspondence in many of these points with the structure of the Crocodile.

In the Crocodile (*Crocodilus acutus*) (see fig. 1, p. 840) the viscera have the same relative position; the two lobes of the liver lie anteriorly, the gizzard is situated on the left side of the body behind the left lobe of the liver, while the intestines occupy the rest of the abdominal cavity. On opening the body-cavity the intestines are not visible; they are in fact covered and concealed by a horizontal septum which runs from side to side of the body, this septum loosely covers the intestinal cells, it is not attached to them anywhere, but arises from the abdominal parietes; anteriorly this membrane is firmly attached to the gizzard, and in fact divides into two layers which enclose and completely shut off that viscus from the rest of the abdominal cavity. The two lobes of the liver are likewise separated from each other and from the gizzard and the rest of the abdominal cavity by septa of fibrous tissue. The arrangement of the abdominal viscera in the Crocodile is therefore practically the same as that which I have just described in *Dromæus*; in both animals the intestinal coils are loosely covered by a horizontal membrane, and in both the two lobes of the liver and the gizzard are enclosed in separate compartments distinct from each other, and from that which contains the intestines.

Fig. 1.

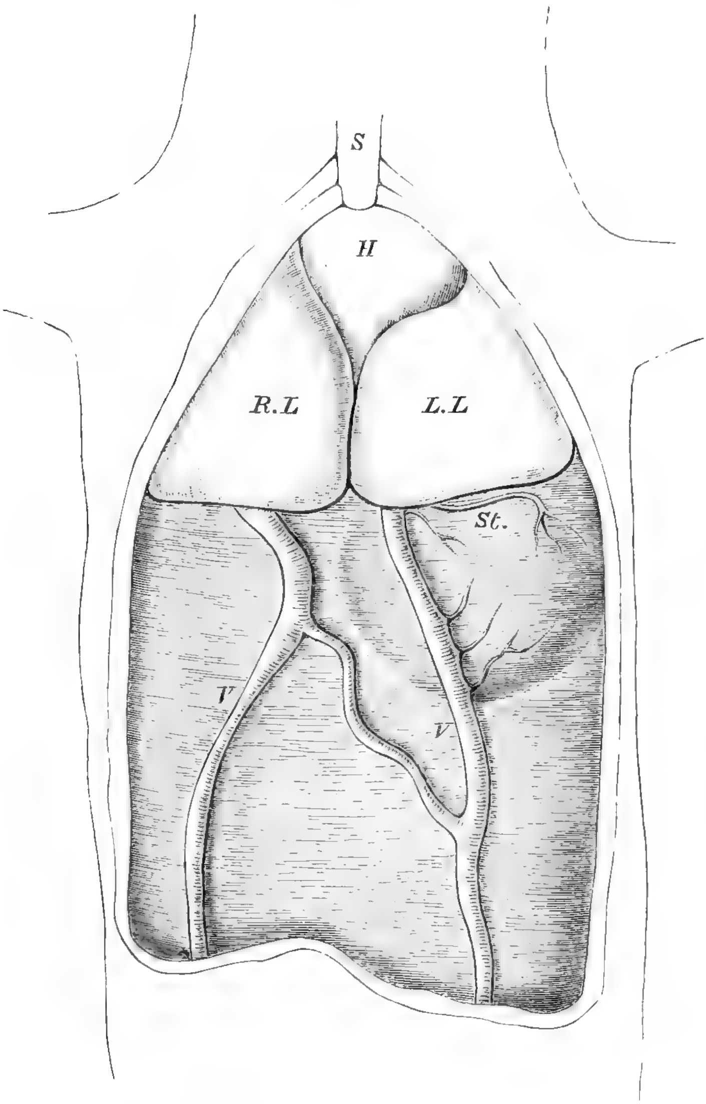


Diagram of abdominal cavity, and certain viscera of *Crocodilus acutus*.

H, Heart; *R.L*, *L.L*, liver-lobes; *St*, Stomach enclosed in a septum of fibrous tissue which passes across the abdominal cavity and covers over the intestines; on the surface of the septum run the anterior abdominal veins (*V*, *V*); *S*, sternum.

The similarity in the disposition of the viscera in birds and reptiles which has been just exemplified by a comparison between the

Crocodile and the Struthiones is not, however, confined to these members of the latter order. Other birds present an identical series of structures. I will now proceed to review these in detail.

The most complete resemblance to the Struthiones is to be found, so far as my dissections enable me to say, in the Cranes; and from a classificatory point of view these resemblances appear to me to have some significance.

I have dissected two species of Cranes, *Grus communis* and *G. monachus*, and the following description applies equally well to both.

The gizzard and the left lobe of the liver are enclosed in a separate compartment of peritoneum; the right lobe of the liver is in another compartment, separate from the left lobe by the vertical septum or umbilical ligament, which runs back for some way, and is in close contact with the right-hand margin of the gizzard. The intestines are covered by a horizontal membrane, which is attached anteriorly to the gizzard, and in fact clasps it round its whole circumference, so that the upper half of the gizzard projects into the abdominal cavity containing the intestinal coils; the gizzard, at least its upper surface, appears to be surrounded by a layer of peritoneum reflected from the horizontal septum. The disposition of the viscera and the various septa is therefore identical with that of *Rhea* and *Dromæus*, and almost identical with that of the Crocodile.

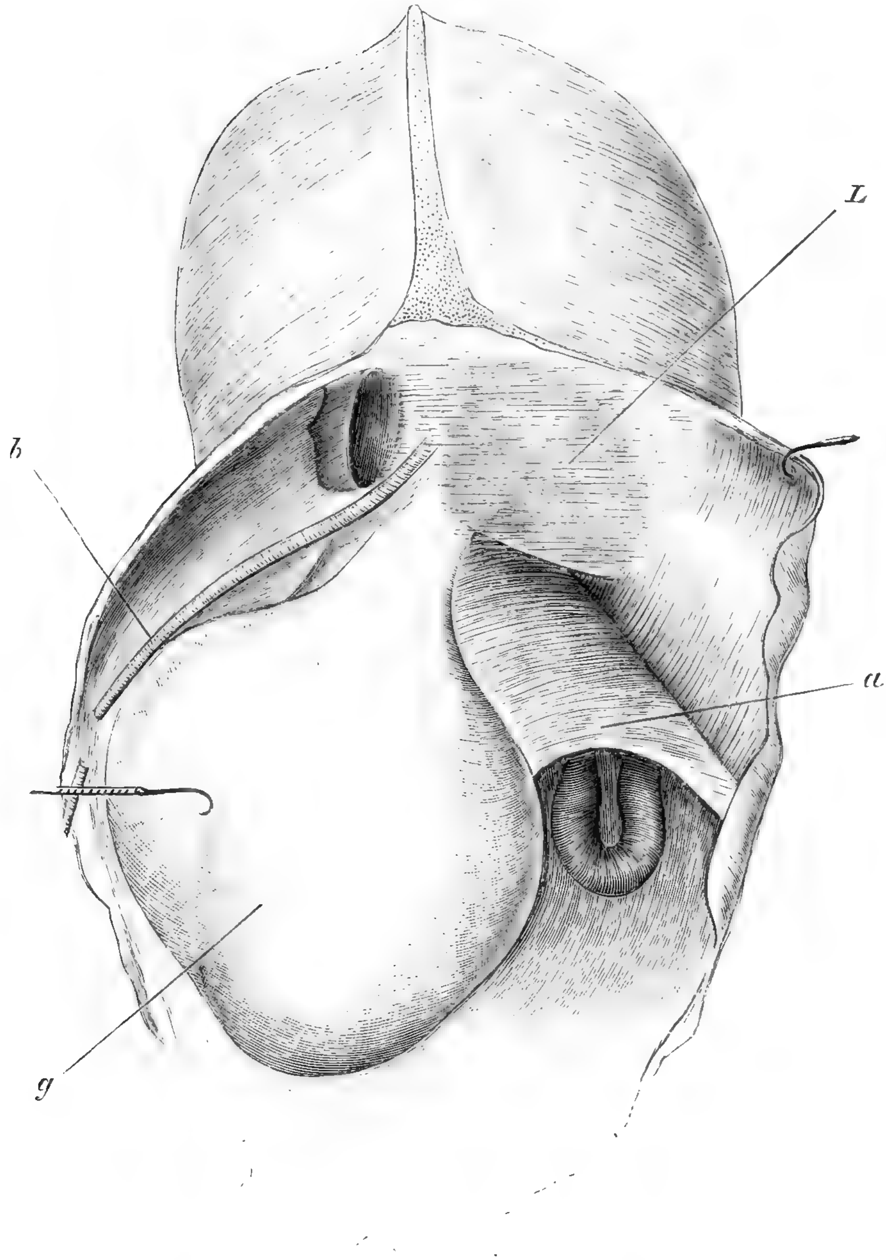
In an interesting paper on the anatomy of the Flamingo[1], Mr. Weldon has referred to the presence of an exactly similar horizontal septum, which he terms "*pseudepiploön*," in this bird and in many Storks; he describes it in the following words:—"On slitting open the abdominal wall of a Stork in the middle ventral line, the only viscera exposed are the two lobes of the liver and the ventral portion of the gizzard. All the rest are hidden by a thick horizontal septum of connective tissue, stretching across the whole body-cavity from the pericardium to the cloaca." It is evident from this quotation that the disposition of the viscera in the Stork is closely similar to what has just been described in the Crane, and only differs in that the lobes of the liver are not enclosed in special compartments of their own. They are stated to be visible on opening the body-cavity, while in the Cranes and Struthious birds the lobes of the liver are not so visible, but require a further dissection of the walls of the compartments which contain them. I have dissected another form of Storks, *Abdimia sphenorhyncha*, in addition to many of those mentioned by Mr. Weldon, and find that the conditions are identical.

The Spoonbill (*Platalea leucorodia*) is a Stork, in so far as the above-mentioned characters are concerned; I believe that the general consensus of opinion is to regard this bird as closely allied to the Storks, and the foregoing considerations confirm this view.

In *Bucorvus abyssinicus* (fig. 2, p. 842) the septa are in the main similar to, but present certain variations from, the types which have been already described. On opening the body-wall the gizzard was

[1] P. Z. S. 1883, p. 639.

Fig. 2.



Abdominal cavity of *Bucorvus abyssinicus*.

g, Gizzard; *a*, band of muscular fibre, connecting it with oblique septum, *b*, umbilical vein; *L*, liver (left lobe) seen through a fibrous partition which separates the cavity containing it from the abdominal cavity.

seen to be suspended in the middle of a horizontal septum passing from side to side of the body ; the structure of this septum, however, differs in different regions ; on the left-hand side of the body (*a*) it forms a flat layer of unstriated muscular fibres connecting the gizzard with the oblique septum of that side of the body ; posteriorly and on the right side the membrane is thin and delicate, and is continuous in front with a kind of membranous diaphragm (*d*) which shuts off the lobes of liver from the rest of the abdominal cavity : this membrane bears a blood-vessel (*b*) which evidently corresponds to the umbilical vein, and passes between the lobes of the liver along a median partition or umbilical ligament which separates them from each other.

In other Hornbills (e.g. *Aceros nipalensis*) I have not found a close similarity to *Bucorvus*, and there are certain other features in the anatomy of this genus which tend to remove it from other Hornbills [1]; there is a well-marked umbilical ligament attached to the sternum, dividing the two lobes of the liver, and passing back as far as the end of the gizzard, but there is apparently no horizontal septum.

The body-cavity of *Larus maximus* is separated into right and left halves by an umbilical ligament continuous from end to end, and a horizontal septum covers up all the abdominal viscera save the liver, and the gizzard, which projects through it.

Phalacrocorax carbo has an identical arrangement.

In the Penguin (*Spheniscus demersus*) the stomach lies rather nearer to the middle line than in birds generally ; indeed there are but few exceptions to the rule that the stomach lies on the left side of the abdominal cavity, as in the Crocodile, Tortoise, &c. Close to the stomach on the right-hand side is the elongated gall-bladder [2], which on account of its length recalls that of the Toucans [3] ; both viscera are suspended in a tough horizontal septum, which has the same relations as in the other birds already described. As in *Bucorvus* the lobes of the liver are shut off by a membrane from the abdominal cavity, each being, of course, in addition separated from the other by a partition, and thus enclosed in a cavity which is floored by a continuation of the horizontal septum.

The horizontal septum is also present in *Plectopterus gambensis*, and in *Bernicla brenta*. A vertical septum immediately underlies the sterna and median line of abdominal walls, and divides lobes of liver ; it starts from the pericardium in front, and is attached to middle line of sternum of abdominal wall as far back as the cloaca. This vertical septum is readily separable into two distinct superposed membranes, of which the left is attached close to the ventral median line of gizzard, while the right, which bears a conspicuous blood-vessel, is attached to the horizontal septum, which, as in the Stork &c., traverses the abdominal cavity, loosely covering the intestines and the posterior region of the gizzard ; anteriorly the horizontal septum is closely

[1] Garrod, Collected Papers, p. 316.

[2] Figured by Watson, Report on the Spheniscidæ, Zool. Chall. Exp. v. xviii. pl. xvi. fig. 9, pp. 169, 195.

[3] See Forbes, Collected Papers, p. 323.

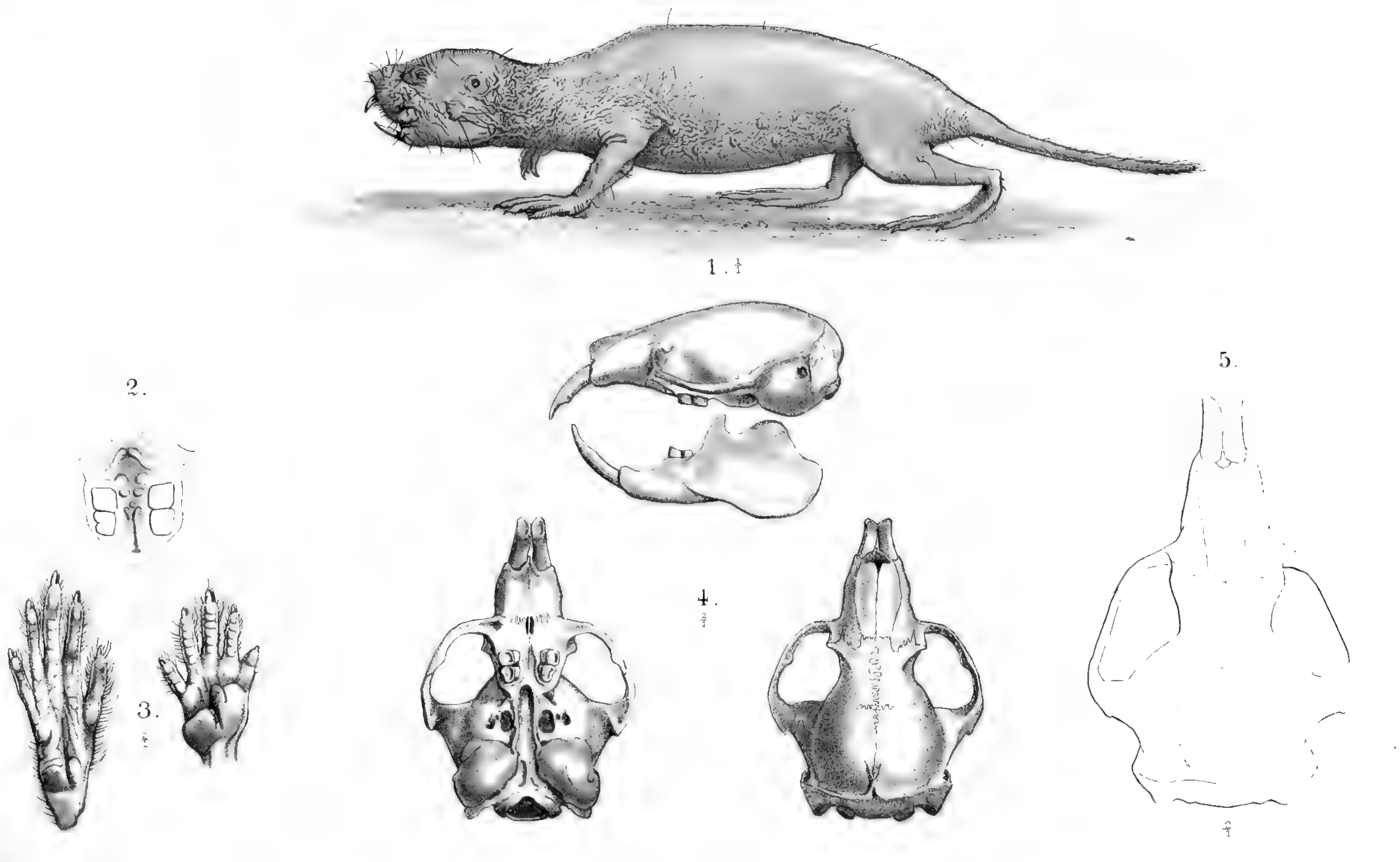
adherent to the walls of the gizzard; the horizont septum is continuous at the sides with the oblique septum; it bears a second blood-vessel, which enters the left lobe of the liver, and is fully as large as the vessel on the right side of the body. It appears to me to be permissible to compare these two abdominal veins with the two that are found in the Crocodile figured in the drawing (fig. 1, p. 840). In no other birds that I have dissected have I been able to find more than a single "umbilical" or anterior abdominal vein which passes along the falciform ligament to the liver. The lobes of the liver are contained in two separate cavities floored by the horizontal septum, but which are not cut off from the abdomen posteriorly by a membranous band, as they are for example in *Bucorvus*. Each lobe of the liver is firmly attached to the vertical septum, and by a special membranous band to the oblique septum. The gizzard does not appear to be enclosed in a special sac as in other birds; the horizontal septum covers it above (ventrally), but dorsally there appeared to be no trace of any covering of fibrous tissue, the gizzard projecting freely into the cavity which contains the intestines. In other birds this horizontal septum is not developed or not developed to so conspicuous an extent as in the types already referred to. It is absent, for instance, in the Strigidæ, judging, at least, from examples of three species belonging to this family which I have had the opportunity of dissecting.

In *Pulsatrix torquata*, *Syrnium aluco* and *Strix flammea* there is no trace of the horizontal septum, except that in all, the gizzard is enclosed in a special sac of peritoneum, and is firmly attached to the parietes, as mentioned by Owen in his 'Comparative Anatomy' [1].

In *Carpophaga ænea* there is no horizontal septum, nor in *Phasianus ellioti* (young). *Rhynchotus rufescens* agrees with the last-mentioned types in having no horizontal septum; the gizzard, however, is firmly attached to the left oblique septum, and is enclosed in a delicate but unmistakable peritoneal sac, as in *Phasianus*. It is interesting to note that in these structural features the Tinamou is totally unlike the Struthious birds.

In a subsequent paper I hope to be able to extend these observations to a larger series of birds. I do not wish to deduce any classificatory results from the facts contained in the present paper, which may perhaps be done later; the main result has been to show that the Ostrich tribe are not more "Crocodilian" in the characters of their abdominal viscera than many other birds. They agree, in fact, very closely with the Cranes and Storks and other birds. In addition to the points of resemblance between Crocodiles and birds indicated by Prof. Huxley, the large "omentum" which covers the intestinal coils in the Reptile evidently corresponds with the omentum (pseudepiploön, Weldon) of the Struthiones, Grallatores, &c.

[1] Vol. ii. p. 163.


1. $\frac{1}{1}$
2.
3. $\frac{2}{1}$
4. $\frac{2}{1}$
5. $\frac{2}{1}$

2. Notes on the Rodent Genus *Heterocephalus*. By Oldfield Thomas, F.Z.S., Natural History Museum.

[Received October 30, 1885.]

(Plate LIV.)

On the 16th of June last I had the pleasure of exhibiting to the Society a specimen obtained on the 29th of January last by Mr. E. Lort Phillips, F.Z.S., at Gerlogobie, Ogardain, Central Somali-land, which I doubtfully referred to *Heterocephalus glaber*, Rüpp., a species discovered by Martin Bretzka in Shoa, Abyssinia, more than forty years ago, and still, so far as I can ascertain, only represented by the original type described by Dr. Rüppell.

By the kindness of the Directors of the Senckenberg Museum in Frankfort I have been allowed to have this original type for examination, and I am thus enabled to give the following notes on the characters and differences of the two species which a comparison of these two specimens proves the genus to consist of.

The second species has been already named and briefly defined in a footnote to the Report in our 'Proceedings' of the exhibition of the specimen [1]; and it was with much pleasure that I connected with this very interesting animal the name of its discoverer, to whom we are indebted for many additions to our knowledge of the mammals and other animals of Central Somali-land.

The type of *Heterocephalus glaber* consists of a dried and mounted skin, with a separate skull, while that of *H. phillipsi* is an adult female preserved in spirit; and I am therefore able to give a somewhat fuller and more exact description of its characters than Rüppell had any opportunity of doing.

Heterocephalus phillipsi is a peculiar-looking little creature, about the size of a Common Mouse, but looking almost more like a tiny hairless puppy on account of its nearly naked skin, small eyes, and peculiar physiognomy (see Plate LIV. fig. 1).

The head is small and flattened from above downwards. The mouth has the structure characteristic of *Georychus* and other burrowing Rodents, the external skin passing right across the mouth-opening inside the incisors. The lips and sides of the muzzle are fairly well clothed with bristly hairs, which form well-marked whiskers, and there are four or five hairs on each side springing from a wart on the side of the face. The eyes are well-defined open slits, with thickened fleshy lids covering the minute eyeballs, which are barely half a millimetre in diameter. The ears are simple round holes, not covered in any way, and unprovided with any trace of an ear-conch. The skin all over the head and body is of a wrinkled warty nature; but this is perhaps partly due to the action of the spirit on the naked skin, as the dried specimen of *H. glaber* shows it much less markedly. The head and body, although apparently

[1] P. Z. S. 1885, p. 612.

naked, are seen on closer inspection to be furnished all over with fine scattered hairs, which give no general appearance of a hairy covering, being so fine and so nearly the colour of the skin as to be almost invisible.

The tail is rather more than half the length of the body without the head, tapers rapidly from its broad and flattened base to its tip, and is thinly covered with fine bristly hairs similar in character to those on the muzzle.

The feet of *Heterocephalus* (Plate LIV. fig. 3) are by far its most highly specialized parts, as might, indeed, be expected in so purely burrowing an animal. The anterior pair are large and strong, and the toes are much longer in proportion to the palm than is the case in *Georychus*. On the proximal half of the palm there are two unusually large and well-developed pads, the rest of the palm being quite smooth; in *Georychus* the pads are quite rudimentary. The pollex, though short, is fully developed and is provided with a minute pointed claw; the fingers are broad and flattened and are provided with similar small conical claws. The third toe is the longest, the second and fourth are about equal, and the fifth, without its claw, reaches to about the middle of the first phalanx of the fourth, and the pollex to the level of the base of the second.

The hind feet, like the fore, have rather long toes in proportion to their length of sole, and in the same way the foot-pads on the sole are restricted to its posterior half, there being only three pads, two near the heel and the third at the base of the fifth toe (Plate LIV. fig. 3). The toes have much the same proportions as those on the fore feet, except that the hallux is relatively longer than the pollex, and the second toe is slightly longer than the fourth.

The most noticeable character of the feet, however, and one quite unique among burrowing Rodents, is the presence of fringes of fine bristles round their edges. These bristles are not unlike those on the hind feet of the Water-Shrew (*Crossopus fodiens*), except that they are longer, further apart, and far finer. They grow all round the edge of each toe, and pass backwards along the sides of the feet to the wrists and ankles, although there is a gap in the series where one would suppose that they would be most wanted, viz. along the outer side of the fifth hind toe, where they are quite absent and have perhaps been worn off. The value of these cilia, by which the spread of the foot is largely increased without any increase in cumbrousness, to an animal which passes its life burrowing in a light sandy soil, is sufficiently obvious to need no comment.

I am unfortunately unable to make out the number of the mammæ, as, owing no doubt to our specimen having been captured out of the breeding-season, they are so small as to be only in one or two instances distinguishable from the minute warts with which the animal's naked skin is covered.

The small intestine measures about 115 mm., the short rounded cæcum about 12 mm., and the combined colon and rectum about 67 mm., 58 per cent. of the small intestines.

The palate-ridges (Plate LIV. fig. 2) consist apparently of about four pairs of small, rounded elevations; but they are so vaguely defined that their exact number is not easily determinable.

The skull of *H. phillipsi* (Plate LIV. fig. 4) is smooth and rounded, short in proportion to its size, with a broad flat brain-case and a very broad interorbital region. Compared to that of *H. glaber* its most striking characteristic is its very much smaller size, as is shown on the Plate (figs. 4 and 5), where the two skulls are drawn on the same scale. This difference in size is so marked that it is obvious at the first glance that the owners of these two skulls could not possibly belong to the same species, notwithstanding their extreme resemblance to each other externally.

In their general proportions also the two skulls differ noticeably, the facial portion of that of *H. phillipsi* being much shorter, in fact only about three quarters of the length of the brain-case, while in *H. glaber* the lengths of the face and brain-case are about equal.

The nasals of *H. phillipsi* are short and somewhat squarely truncated behind, and are surpassed posteriorly by the ascending processes of the premaxillæ, while in *H. glaber* they are more pointed behind, and are about equal in length to the premaxillary processes.

The anterior part of the zygomata, opposite the postorbital processes, is much more bowed out in *H. phillipsi* than in *H. glaber*.

On the underside of the skull the only difference appreciable is that the palatine foramina, minute in both, are still smaller in *H. phillipsi* than in *H. glaber*.

Passing to the teeth, we find a very remarkable distinction between the two animals. In *H. glaber* there are three round and simple molars in each jaw; but in *H. phillipsi* there are only two, both above and below, the tooth absent being apparently the first. In any other family this difference would be of generic importance; but in the present group analogous differences occur even in the same species, as for example in *Heliophobius argenteo-cinereus*, Peters, which, as its describer has recorded [1], sometimes has two and sometimes three premolars. And, again, *Georychus capensis*, Pall., has sometimes one and sometimes no premolar. For the present therefore too much stress must not be laid upon the difference between the only two specimens of *Heterocephalus* as yet examined, nor can *H. phillipsi*, in which there are only two molars, be said to be as highly specialized in this respect as *Hydromys*, otherwise the only Rodent with as few molars in each jaw. *H. phillipsi* has, in fact, no doubt, as a rule, the same number of molars as *H. glaber*, even if both do not sometimes have either one or two premolars developed in addition in front of the molars.

The teeth themselves are rounded and very simple, having each but one single external fold of enamel, which seems to disappear as time advances, as the specimen of *H. phillipsi*, apparently the more aged of the two, shows scarcely a trace even of this fold. The lower molars, at least of *H. phillipsi*, have each one external and one internal fold, and from Rüppell's description those of *H. glaber* are

[1] Reise n. Mossamb., Säug. p. 142, 1852.

similar; but the lower jaw of the type of that species has unfortunately been lost.

The incisors, as in the allied genera, project nearly horizontally forward; and their anterior faces are somewhat flattened and bevelled on their interior halves, so that, as they wear down, the resulting edge of the two incisors combined is more or less **W**-shaped, but with the outer arms of the **W** very much shorter than the inner.

Externally I can find no specific differences whatever, except in the greater size of the hind feet of *H. glaber*. It must, however, be remembered that in such a genus as *Heterocephalus*, in which there are neither ear-conchs, to vary in shape and size, nor hairs, to vary in colour and length, and where there is only one possible manner of life, there is very little room for the ordinary forms of specific variation as found in other genera of mammals.

The measurements of the type specimens of the two species are as follows:—

	H. phillipsi (♀ in spirit). mm.	*H. glaber* (stuffed). mm.
Head and body ..	80	(c) 95
Tail	35	39
Hind foot	16·6	21·2
Forearm and hand	21·0	—
Head	21·5	—
Muzzle to ear ..	15·2	(c) 20·0
Muzzle to eye ..	7·0	—
Eye to ear	7·0	—

Skulls:—

	H. phillipsi.	*H. glaber.*
Occiput to tip of nasals.........	16·1	21·5
Occiput to tip of incisors	19·4	26·4
Basal length[1]..................	16·0	21·5
Greatest breadth	13·6	18·3
Brain-case, length	9·2	11·0
Brain-case, breadth	9·4	12·0
Nasals, length	5·1	7·8
Nasals, breadth	3·2	4·4
Interorbital breadth	5·1	6·0
Back of incisors to m^1	5·7	8·0
Palatine foramina	1·1	2·3
Palatine foramina to posterior nares...	4·0	6·1
Basi-cranial axis	6·1	—
Palate, length	9·1	13·6
Palate, breadth outside m^2	4·3	5·0
Palate, breadth inside m^2	1·5	2·2
Palate, least breadth inside molars .	1·2	1·3
Incisors, breadth	2·1	2·9
Incisors, length	3·9	5·4

[1] From basion

Finally, as to the systematic position of *Heterocephalus*. It has been placed by Rüppell, Brandt, Alston, and others close to *Rhizomys* among the Spalacinæ; but my examination of these two specimens proves unquestionably that it is a member of the other half of the family, namely the *Bathyerginæ*, and that it is really very closely allied to *Georychus*, of which it may, in fact, be considered a sort of degraded representative, specialized for an entirely subterranean life. For such a life its hairless mole-shaped body, nearly suppressed eyes, and bristle-clad feet admirably adapt it, while, on the other hand, its deficiency both of protective covering and power of sight would be fatal to it were it to venture above ground, where it would be exposed to the fierce rays of an African sun, and to the attacks of the host of enemies which by its underground life it is enabled to escape. These deductions from the structural characters of *Heterocephalus* are fully borne out by the interesting notes on its habits contributed to the Society by Mr. Lort Phillips (suprà, p. 611).

EXPLANATION OF PLATE LIV.

Fig. 1. *Heterocephalus phillipsi*; female, natural size.
2. Palate-ridges.
3. Fore and hind feet, showing sole-pads and fringing bristles. Twice natural size.
4. Skull. Twice natural size.
5. Skull of *H. glaber*. Twice natural size.

3. Characters of an apparently new Species of Tanager of the Genus *Calliste*. By P. L. Sclater, M.A., Ph.D., F.R.S., Secretary to the Society.

[Received October 4, 1885.]

In the series of skins acquired by the British Museum from the Gould Collection is a single specimen of what, after careful examination, I cannot avoid referring to a new species of *Calliste*. This I propose to dedicate to the great ornithologist to whom the type formerly belonged, as

Calliste gouldi, sp. nov.

Supra lucide viridis, interscapulio nigro variegato; fronte et loris nigris; pileo antico et regione oculari nitide cæruleis; alis caudaque nigris lucido viridi marginatis; tectricibus alarum minoribus aurescente tinctis: subtus clare viridis, in ventris lateribus cærulescente lavata; mento nigro; macula magna gulam mediam occupante cærulescenti-nigra; ventre imo medio et crisso pallide fulvis; subalaribus albis; rostro nigro; pedibus pallide brunneis. Long. tota 4·8, *alæ* 2·7, *caudæ* 2·0.
Hab. Brasilia Merid. Or.
Obs. Species *C. thoracicæ* affinis, et colore corporis superioris fere

similis, sed plaga gutturali cærulescenti-nigra primo visu distinguenda.

The single skin that I have as yet seen of this species is obviously of Brazilian manufacture. It is strange that the species has so long remained undiscovered.

4. Description of a new Frog of the Genus *Megalophrys*. By G. A. Boulenger, F.Z.S.

[Received November 3, 1885.]

(Plate LV.)

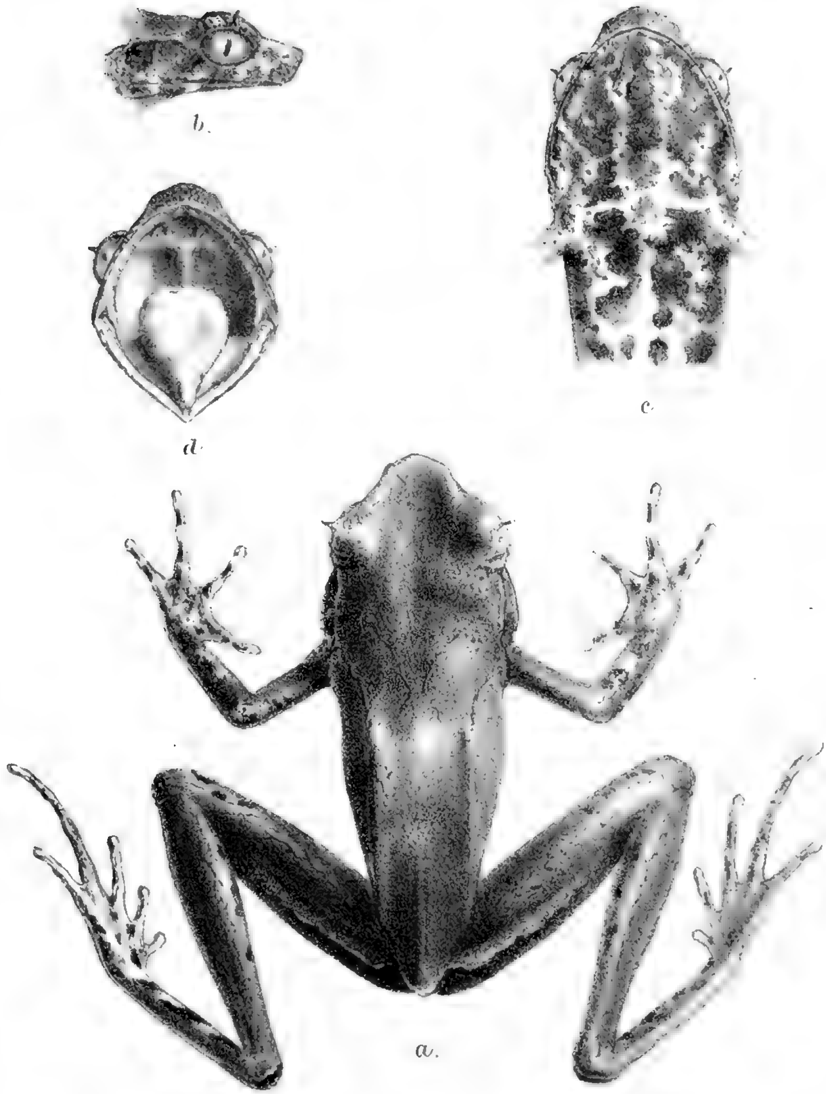
Megalophrys longipes, sp. n. (Plate LV.)

Tongue pyriform, indistinctly nicked posteriorly. Vomerine teeth in two small groups just behind the line of the posterior borders of the choanæ. Head broader than long, much depressed; snout very short, obliquely truncate, concave above and on the sides, with strong canthus rostralis; nostril equally distant from the eye and the middle of the rostral extremity; interorbital space concave, a little broader than the upper eyelid; tympanum distinct, oval, its distance from the eye exceeds its greatest diameter. Fore limb long and slender; first finger extending beyond second. Hind limb very long, the extremity of the femur reaching the shoulder and the tibio-tarsal articulation far beyond the end of the snout; toes slender, with a slight rudiment of web, swollen at the tips; no subarticular nor metatarsal tubercles. Skin smooth above, with small warts on the flanks, and two pairs of delicate oblique folds, converging posteriorly, on the scapular region; a fold from the eye to the shoulder, passing above the tympanum; upper eyelid with a small horn-like tubercle on its outer edge; lower surfaces smooth. Olive-brown above, sides of head speckled with blackish, and with oblique yellowish vertical bars; digits edged with yellowish and with yellowish cross bars; hinder side of thighs, upper half reddish brown, lower blackish brown, the two colours sharply separated; lower surfaces pale reddish brown, largely marbled and spotted with dark brown. From snout to vent 60 millim.

A single specimen, apparently a female, from the mountains of Perak, Straits of Malacca, at a height of 3300 feet; presented to the Natural History Museum by L. Wray, Esq., Curator of the Perak Museum. This species must be very rare, as the specimen described is the only one obtained by Mr. Wray during a residence of about three years on the hills.

EXPLANATION OF PLATE LV.

a. Upper view of *Megalophrys longipes*, size of life.
b. Lateral view of head.
c. Lower view of head and pectoral region.
d. Open mouth.



P. Smit del et lith.

Mintern Bros. imp.

MEGALOPHRYS LONGIPES.

December 1, 1885.

Prof. W. H. Flower, LL.D., F.R.S., President, in the Chair.

The Secretary made the following report on the additions to the Society's Menagerie during November 1885 :—

The total number of registered additions to the Society's Menagerie during the month of November was 105, of which 60 were by presentation, 18 by purchase, 4 by birth, 5 were received in exchange, and 18 received on deposit. The total number of departures during the same period, by death and removals, was 131.

The most noticeable additions during the month were :—

1. A pair of Pale Fennec Foxes (*Canis pallidus*), presented by Capt. J. S. Talbot, 1st Shropshire Light Infantry, November 24th.

Mrs. Talbot informs me that these animals were dug out of a hole by Capt. Talbot, while on the march from Suakim to Handoub, when quite small, and were for some weeks fed by hand.

The species was described and figured in 1826 (Rüpp. Zool. Atlas, tab. xi. p. 33), but appears to be little known, and is new to the collection. The living examples seem to agree with the stuffed specimen in the British Museum.

2. Twelve examples of the Spectacled Salamander (*Salamandrina perspicillata*) from Italy, presented by Prof. H. H. Giglioli, C.M.Z.S., Nov. 28. New to the collection.

Mr. Sclater laid on the table several Birds which had been sent to him for exhibition by Mr. H. Whitely of Woolwich, and called special attention to a Hornbill, the casque of which coincided nearly with that described by Mr. G. R. Gray in 1871 as *Buceros casuarinus* (Ann. & Mag. Nat. Hist. ser. 4, vol. viii. p. 437, pl. xvii. ; see also Elliot's Mon. Bucerotidæ, pl. xxxiv.).

Upon this specimen being taken to the British Museum in order to be compared with the type, Mr. Sharpe had pointed out to Mr. Sclater that it was certainly only the young stage of *Bycanistes cylindricus*. It would seem, therefore, that the supposed *Buceros casuarinus* had been founded upon the casque of a young specimen of *B. cylindricus*, of which the feathers at the back of the head had been removed.

Mr. W. T. Blanford exhibited on behalf of Capt. C. S. Cumberland the head of a Wild Sheep from Ladak, which he considered to belong to a hybrid between *Ovis hodgsoni* and *O. vignei*.

The following papers were read :—

1. On the Lepidoptera of Bombay and the Deccan. Part IV.[1] HETEROCERA (continued). By Lieut.-Col. C. SWINHOE, F.L.S., F.Z.S.

[Received August 19, 1885.]

(Plates LVI., LVII.)

GEOMETRITES.

ENNOMIIDÆ.

1. HYPERYTHRA PHANTASMA.

Hyperythra phantasma, Butler, P. Z. S. 1881, p. 615.
Poona, October.

2. HYPERYTHRA LIMBOLARIA.

Hyperythra limbolaria, Guénée, Phal. i. 101, 153, pl. 3. figs. 3, 4.
Poona, October, November, and December; Bombay, October, November, and December.

3. CHIZALA DECIPIENS.

Chizala decipiens, Walker, xx. 263.
Belgaum, September; Poona, July, October, and November.

4. SCARDAMIA METALLARIA.

Scardamia metallaria, Guénée, Phal. i. 89, 134.
Poona, December; Bombay, October.

5. AZELINA CLELIA.

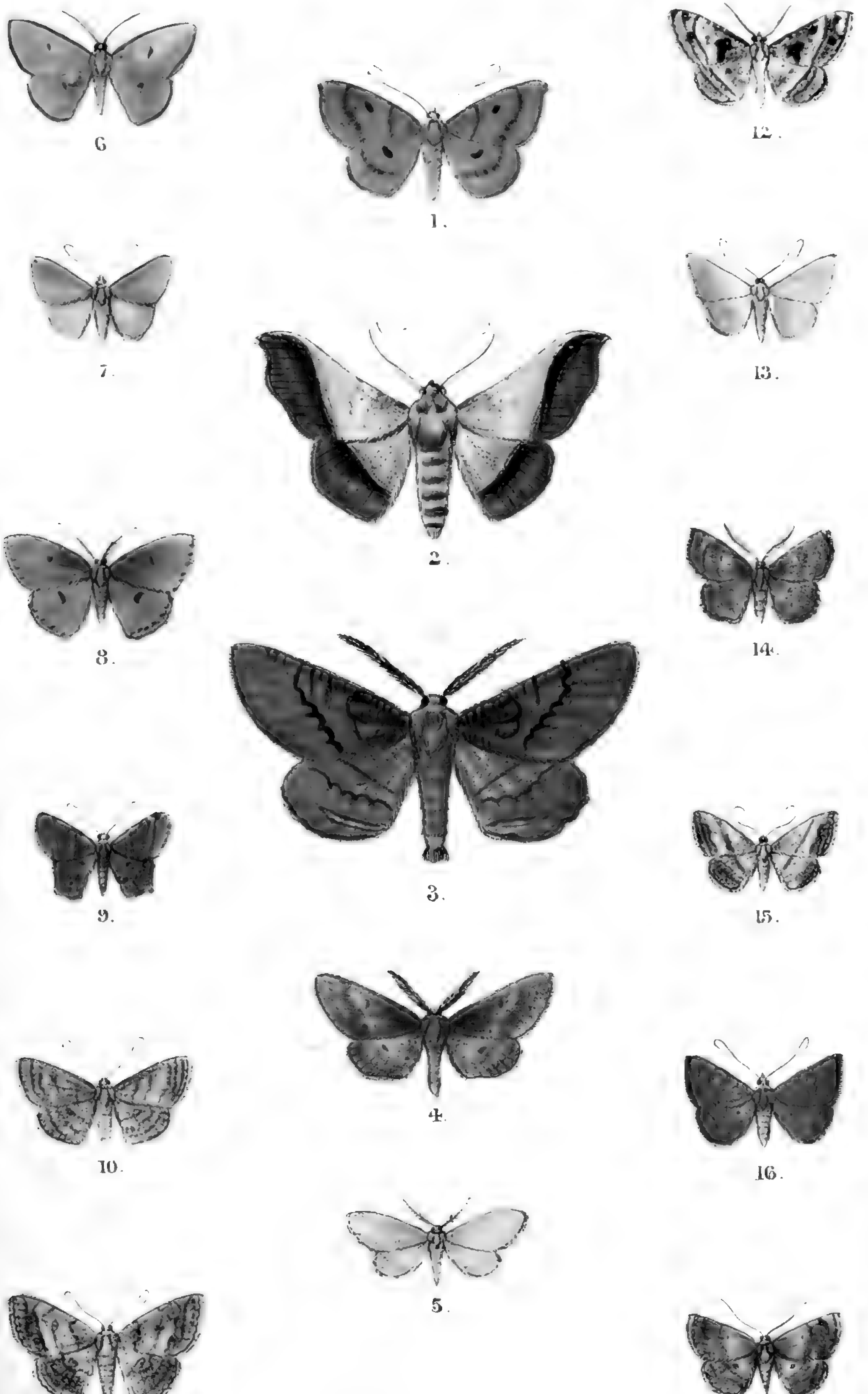
Phalæna clelia, Cramer, Pap. Exot. iii. p. 172, pl. 283. figs. B, C.

ŒNOCHROMIDÆ.

Gen. nov. CHILKASA.

Male. Fore wing rather long, triangular, costa much arched towards the end, apex very acute, falcate, exterior margin very oblique and convex in the middle, posterior margin convex towards the end; first subcostal emitted at fully one half before the end of the cell, second at one sixth, trifid, fifth from end of the cell and slightly touching third near its base; discocellular concave, radials from close to upper and lower end; middle median from angle close to end of the cell, lower at nearly two fifths; submedian much curved downward from the base. Hind wing very short, exterior margin oblique and convex, anal angle obtusely pointed; cell one third the length; two subcostals from the end of cell; discocellular concave, radial from lower end; two upper medians from end of the cell, lower at nearly one third; submedian and internal vein recurved. Body stout; thorax laxly clothed; palpi ascending, recurved,

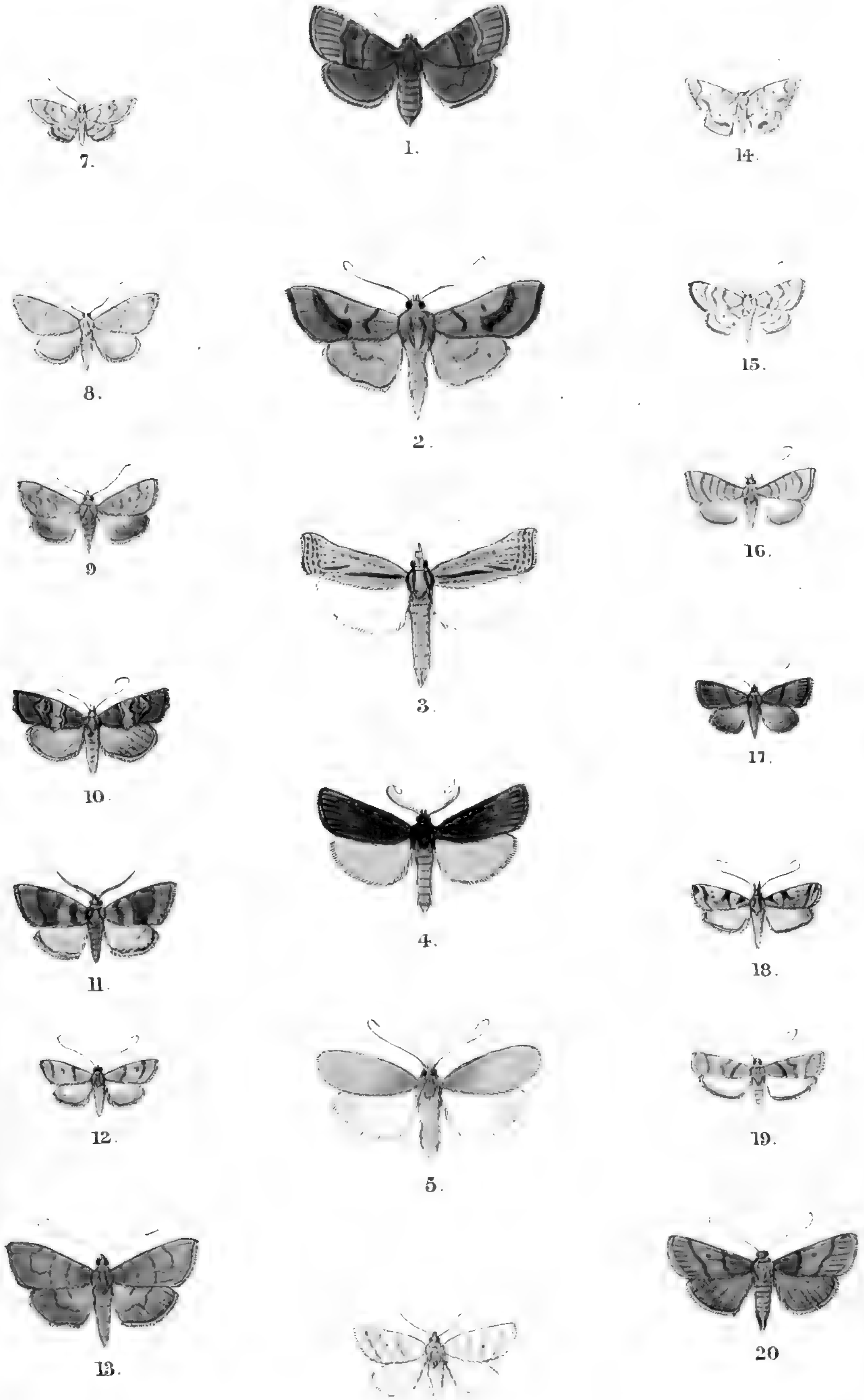
[1] Continued from page 476.



F. C. Moore del. et lith.

Mintern Bros. imp.

NEW INDIAN LEPIDOPTERA.



F. C. Moore del. et lith.

Mintern Bros. imp.

NEW INDIAN LEPIDOPTERA.

rounded at the top, pointed in front, compactly squamous, joints indistinct; antennæ biciliated in front, and the shaft rough-scaled, with long lashes above; legs rather stout; tibiæ densely clothed with long fine silky hairs; spurs long, unequal.

6. CHILKASA FALCATA, n. sp. (Plate LVI. fig. 2.)

Bombay, September.

Antennæ, body, and wings fawn-colour; palpi black. Wings thinly irrorated with brown atoms, a black dot at the end of the cell of the fore wings, a double brown discal, nearly straight line across both wings, the space beyond dark maroon-brown, darker in the fore than in the hind wings; marginal line yellow; fringe brown. Underside pale fawn-colour, with medial and discal straight brownish lines across both wings.

Expanse of wings $2\frac{1}{10}$ inches.

BOARMIIDÆ.

7. HYPOCHROMA DISPENSATA.

Hypochroma dispensata, Walker, xxi. 435.

Poona, September; Bombay, August, September, and October.

8. HYPOCHROMA PERFECTARIA.

Hypochroma perfectaria, Walker, xxi. 434.

Poona, May.

9. HYPOCHROMA CRENARIA.

Hypochroma crenaria, Guénée, Phal. i. 278, 441.

Bombay.

10. BOARMIA INFIXARIA.

Boarmia infixaria, Walker, xxi. 379.

Bombay.

11. BOARMIA GLEBA, n. sp. (Plate LVI. fig. 3.)

Poona, May.

Allied to *Boarmia ferrolavata,* Walker. *Male.* Reddish brown, irrorated with blackish brown; antennæ blackish, with its branches grey; anal tuft pale pinkish; wings with dentated black lines; fore wings with an inner incomplete line, a medial line, which is slightly bent and deeply dentated in the fore wings, and is almost straight and even in the hind wings; discal and submarginal dentated lines, very distinct in the hind wings, the former almost joining the middle line in the abdominal margin; both these lines are obsolete, or only very faintly indicated on the fore wings; marginal line brown, sinuous.

Expanse of wings $2\frac{2}{10}$ inches.

12. BOARMIA GELIDARIA.

Boarmia gelidaria, Walker, xxvi. 1537.

Poona, September; Bombay, November.

13. Boarmia contectaria.

Boarmia contectaria, Walker, xxvi. 1537.

Poona, November.

14. Boarmia cornaria.

Boarmia cornaria, Guénée, Phal. i. 254, 390.

Poona, September, October, November, and February; Bombay, September.

15. Petelia medardaria.

Petelia medardaria, Herr.-Sch. Exot. Schm. pl. 94. f. 534.
Bargosa chacoraca, Walker, xxi. 481.
Bargosa chandubija, Walker, xxi. 480.
Bargosa distracta, Walker, xxi. 481.

Belgaum, September; Poona, October, November, and December; Bombay, October and November.

16. Petelia fasciata.

Bargosa fasciata, Moore, P. Z. S. 1867, p. 634, pl. 32. f. 8.

Poona, September; Bombay, October.

17. Pachydia vexillaria.

Pachydia vexillaria, Guénée, Phal. ii. 138, 1147.

Poona, December.

Geometridæ.

18. Agathia hilarata.

Agathia hilarata, Guénée, Phal. i. 381, 612.

Poona, October and November.

19. Timandra diatomaria.

Timandra diatomaria, Walker, xxvi. 1616.

Poona, November to February.

Very variable in colour, ranges from pale reddish to dark green.

20. Nemoria frequens.

Nemoria frequens, Butler, P. Z. S. 1881, p. 616.

Poona, October and November.

21. Nemoria parvulata.

Nemoria parvulata, Walker, xxvi. 1559.

Poona, October.

22. Geometra dissita.

Geometra dissita, Walker, xxii. 519.

Poona, August; Bombay, July.

23. Geometra dissessa.

Geometra dissessa, Walker, xxii. 521.

Poona, November.

24. Geometra parvulata.

Geometra parvulata, Walker, xxvi. 1555.

Poona, October; Bombay.

25. Geometra indecretata.

Geometra indecretata, Walker, xxvi. 1555.

Bombay, March and November.

26. Geometra aperta, n. sp. (Plate LVI. fig. 7.)

Bombay.

Pale ochreous; wings mostly very pale, nearly white; costal border reddish ochreous; basal and apical portions of fore wings suffused with the same coloration; the large veins distinct; wings otherwise unmarked. Body pure white, unmarked.

Expanse of wings $\frac{9}{10}$ inch.

27. Iodis quantula, n. sp. (Plate LVI. fig. 6.)

Bombay.

Male. Antennæ, head, and thorax sandy white; abdomen silvery white; antennæ broadly bipectinated to the tips. Wings pale sea-green; a minute black dot at the end of the cell in the fore wings; the entire margin of both wings all round with a slight flesh-coloured tinge; some minute reddish points on the margin. Underside whitish, shining, unmarked.

Expanse of wings 1 inch.

This may probably be the male of *Iodis vivilacea* of Walker.

28. Iodis vivilacea.

Iodis vivilacea, Walker, xxii. 544.

Bombay, November.

29. Comibœna glareosa, n. sp. (Plate LVI. fig. 8.)

Bombay.

Pale sandy-buff colour, except the antennæ, which are silvery white; apex of fore wings with a small diffuse space of grass-green; the entire surface of both wings sparsely covered with very fine brown atoms, a minute brown dot at the end of the cell of the fore wings, and a duplex brown spot at the end of the cell in the hind wings; marginal points brown, large and very distinct.

Expanse of wings 1 inch.

30. Thalera obnupta, n. sp. (Plate LVI. fig. 9.)

Bombay.

Antennæ, palpi, head, and thorax fleshy buff; abdomen silvery white; wings dull sea-green, a broad diffuse band on the costa of the fore wings, and the whole basal portion of both wings dirty chrome-yellow; antemedial and discal white lines across both wings, nearly straight, slightly bent outwardly on the hind wings; fringe whitish. Underside silvery white, unmarked.

Expanse of wings $\frac{7}{10}$ inch.

EPHYRIDÆ.

31. ANISODES OBLIVIARIA.

Anisodes obliviaria, Walker, xxii. 643.

Bombay.

32. EPHYRA CLEORARIA.

Acidalia cleoraria, Walker, xxiii. 792.

Sattara, February and June; Poona, February, March, April, and October; Bombay, July and October.

33. EPHYRA INVEXATA.

Epione invexata, Walker, xxvi. 1497.

Belgaum, September; Poona, August.

34. EPHYRA QUIETA, n. sp. (Plate LVI. fig. 1.)

Poona, October; Bombay, December.

Dull chrome-yellow, covered with greyish striations, a brown spot with a white centre at the end of the cell in all the wings; an antemedial thin, brownish-grey band on the fore wings, nearly upright; a waved discal broad band of the same colour across both wings, attenuated towards the costa on the fore wings. Underside of the same colour as on the upper side, but the striations are much thicker and darker; the spots at the end of the cells are similar, the antemedial band on the fore wings is absent; but the discal band on both wings is more uniform and darker-coloured.

Expanse of wings $1\frac{3}{10}$ inch.

35. EPHYRA SUBDOLARIA, n. sp.

Bombay, November and December.

Bone-colour, irrorated with sandy grey; palpi reddish brown, white beneath; head black; front white; collar and abdomen whitish. Wings with the apical border of the fore wings slightly luteous; marginal points of both wings black, a few indistinct brown dots in the disk.

Expanse of wings $1\frac{1}{10}$ inch.

36. EPHYRA FLUIDARIA, n. sp. (Plate LVI. fig. 10.)

Poona, December; Bombay, July and September.

Yellowish grey, finely irrorated with deep black atoms; costa of fore wings grey; a black dot on a more or less blackish diffuse rounded spot, at the end of each cell; a faint blackish fascia across both wings, passing over these spots; three dentated lines close together, across both wings, on the marginal border, the first acutely dentated; on some specimens these lines are very faint, and on others very black and distinct; marginal points black.

Expanse of wings 1 inch.

IDÆIDÆ.

37. IDÆA ADDICTARIA.
Acidalia addictaria, Walker, xxii. 749.
Poona, December.

38. IDÆA LIGATARIA.
Acidalia ligataria, Walker, xxii. 748.
Bombay, October.

39. IDÆA PATULARIA.
Acidalia patularia, Walker, xxxv. 1633.
Poona, December.

40. IDÆA REMOTATA.
Acidalia remotata, Walker, xxii. 748.
Poona, September and December; Bombay, September.

41. IDÆA ABSCONDITARIA.
Acidalia absconditaria, Walker, xxiii. 757.
Poona, October, November, and December; Bombay.

42. IDÆA WALKERI.
Idæa walkeri, Butler, P. Z. S. 1883, p. 170.
Acidalia extimaria, Walker, xxiii. 794.
Poona, September; Bombay, October and November.

43. IDÆA ADEPTARIA.
Acidalia adeptaria, Walker, xxii. 753.
Bombay.

44. IDÆA ACTUARIA.
Acidalia actuaria, Walker, xxii. 752.
Bombay, October.

45. IDÆA DEFAMATARIA.
Acidalia defamataria, Walker, xxii. 752.
Poona, September and October; Bombay, September.

46. IDÆA IDEARIA, n. sp. (Plate LVI. fig. 15.)
Poona, October and December; Bombay.

Allied to *Idæa humeraria*, Walker: pale yellowish grey, shining, sparsely irrorated with grey; a brown dot at the end of the cell in the fore wings, a wavy grey central fascia across both wings; a discal brown line also across both wings, which in the fore wings is sinuous and in the hind wings dentated, and is marked outwardly with blackish patches in the centre and on the hinder margin in the fore wings, and in some specimens with a faint blackish fascia on the hind wings; some greyish submarginal marks; marginal points deep black.

Expanse of wings $\frac{8}{10}$ inch.

47. **Idæa grandicularia**, n. sp. (Plate LVI. fig. 11.)

Poona, October.

Whitish, irrorated with grey atoms; costa grey, a black dot surrounded by a grey ring at the end of the cell in all the wings; medial and discal, sinuous, hardly dentated lines, across both wings; an inner line of the same kind also on the fore wings, the space between the discal line and the outer margin on both wings suffused more or less with grey, with two brownish patches on the fore wings, one a little above the centre of the discal line, and the other on the hinder margin, both patches on the outer side of the line; marginal points black; fringe tinged with chrome-yellow. Underside white, with the cell dots, the medial line, and outer markings showing through the wing.

Expanse of wings $1\frac{1}{10}$ inch.

48. **Idæa chotaria**, n. sp. (Plate LVII. fig. 14.)

Poona, November and December; Bombay.

Yellowish testaceous, a black dot at the end of each cell, another black dot on the costa of the fore wings near the apex, a faint discal line from this dot downwards, across both wings; two suffused brown patches outside this line, on the fore wings—one in the hinder margin, the other just above it and touching it; another patch of the same description on the abdominal border of the hind wings; in some specimens this patch runs into the discal line like an indistinct band.

Expanse of wings $\frac{5}{10}$—$\frac{6}{10}$ inch.

49. **Zanclopteryx infelix**, n. sp. (Plate LVI. fig. 13.)

Poona, October and November.

Antennæ grey, with silvery-white bands; palpi black, with the last joint silvery white; eyes black; wings semihyaline. Body and wings pure silvery white; costa, outer margin, and a very faint submarginal shade on the fore wings, greyish: otherwise the wings are quite unmarked.

Expanse of wings $\frac{8}{10}$ inch.

50. **Hyria gratarria.**

Hyria grataria, Walker, xxii. 663.

Poona, October.

51. **Hyria volutaria**, n. sp. (Plate LVI. fig. 14.)

Bombay.

Ochreous-red, irrorated with grey. Head and underside of the antennæ pure white; a black dot at the end of each cell; lines grey, indistinct: on the fore wings, antemedial, bent inwards, towards the costa; medial and discal upright, both of them extending also across the hind wings, where they bend outwardly in the centre; marginal border brownish, dentated; some submarginal pale marks on both wings; fringe pale reddish yellow, interrupted with reddish at the end of each marginal tooth. Underside pale reddish grey, with a darker medial and submarginal shade; marginal border whitish.

Expanse of wings $\frac{9}{10}$ inch.

52. Asthena urbica, n. sp.

Bombay, July.

Ochreous, densely irrorated with red; lines red. Fore wings with an antemedial nearly upright line, bent inwards near the costa; a postmedial mark on the costa, like the commencement of another line; a submarginal line, which is dentated sharply, outwardly, and touches the outer margin at one third below the apex, and gradually inclines outwardly, terminating at the hinder angle. Hind wings with an antemedial and a submarginal line, which also has one tooth touching the outer margin below the apex; fringe yellow, interrupted with brown.

Underside pale chrome-yellow, with all the lines well defined and dark brown, the postmedial line of the fore wings being complete and distinct.

Expanse of wings $\frac{7}{10}$ inch.

53. Asthena tristicula, n. sp. (Plate LVI. fig. 17.)

Bombay.

Pale yellowish, testaceous, irrorated with grey. Head dark brown; thorax and abdomen brown. A blackish dot at the end of the cell in each wing; costa grey; a medial and a discal grey band across each wing, with two patches of the same colour on the fore wings, connecting the discal band with the outer border, at one third below the apex and one third above the hinder angle. Hind wing with a similar diffuse greyish space on the margin, near the anal angle. Underside much paler than the upper side, with the bands and markings showing through.

Expanse of wings $\frac{8}{10}$ inch.

54. Asthena querula, n. sp. (Plate LVI. fig. 16.)

Poona, March.

Reddish ochreous, irrorated with small greyish-brown square spots or patches; a black dot at the end of each cell; four irregular, incomplete, sinuous, pale greyish-brown bands, across all the wings, with marginal and submarginal irregular lines, or thin bands, composed of small square spots of the same colour; fringe a little paler than the wing.

Underside pale yellowish grey; markings brown; a dot at the end of each cell; both the wings with a medial complete line, a discal, and a submarginal line of dots, and a marginal band.

Expanse of wings $\frac{9}{10}$ inch.

55. Somatina anthophilata.

Somatina anthophilata, Guénée, Phal. ii. 11, 907, pl. 18. fig. 2.

Poona, October.

56. PRIONIA VIOLACEARIA.

Prionia violacearia, Guénée, Phal. i. 144, 231.

Poona.

57. PHALACRA VIDHISARA.

Hemerophila vidhisara, Walker, xxi. 319.

Bombay, October.

CABERIDÆ.

58. STEGANIA UVIDULA, n. sp.

Poona, October.

Pale yellow, covered with reddish striæ; antennæ and palpi reddish brown. Head pale yellow; thorax with a diffuse, reddish-brown band in front. Wings with a blackish streak at the end of each cell; an antemedial, nearly straight, red line on the fore wings. Both wings with a red, discal, slightly waved line, and a red marginal line.

Underside paler; marks as above, except that the inner line on the fore wings is absent.

Expanse of wings $1\frac{2}{10}$ inch.

MICRONIIDÆ.

59. MICRONIA CAUDATA.

Phalæna caudata, Fabr. Ent. Syst. iii. 2, 63, 124.

Belgaum, October.

60. MICRONIA ACULEATA.

Micronia aculeata, Guénée, Phal. ii. 26, 928, pl. 13. fig. 8.

Poona, July and October.

MACARIIDÆ.

61. MACARIA ELEONORA.

Phalæna eleonora, Cramer, Pap. Exot. iii. p. 172, pl. 288. figs. E F, G.

Bombay, July to October. In great plenty.

62. MACARIA METAGONARIA.

Azelina metagonaria, Walker, xxvi. p. 1518.

Bombay.

63. MACARIA PERVOLGATA.

Macaria pervolgata, Walker, xxiii. p. 930.

Poona, October.

64. MACARIA VASUDEVA.

Macaria vasudeva, Walker, xxiii. p. 933.

Bombay, December.

65. Macaria myaudaria.

Macaria myaudaria, Walker, xxvi. p. 1649.

Matheran, May.

66. Macaria zebrina.

Tephrina zebrina, Butler, P. Z. S. 1883, p. 171.

Poona, September to February (very plentiful); Bombay.

67. Macaria strenuataria.

Macaria strenuataria, Walker, xxvi. p. 1647.

Poona, October.

68. Macaria lithina.

Tephrina lithina, Butler, P. Z. S. 1883, p. 171.

Poona, October.

69. Macaria granitalis.

Tephrina granitalis, Butler, P. Z. S. 1883, p. 171.

Poona, September to December.

70. Macaria boaria, n. sp. (Plate LVI. fig. 12, ♂.)

Poona, October.

Allied to *M. indotata*, Walker.

Greyish white irrorated with chocolate-brown; thorax with the collar yellow; abdomen whitish; wings with the irrorations densely packed in places, forming in the fore wings a dark interrupted line along the costa; an inner and a median line, the former bent outwardly, nearly meeting the median line at its centre, and in some specimens forming a diffuse brown patch there; the median line runs also across the hind wings, as does also an outer waved line, with the space between these two lines whitish in both wings; outside the outer line, and touching it, is a diffuse brown band, with a black spot in its centre, which is more or less obsolete in some specimens and very prominent in others; marginal points brown, distinct.

Expanse of wings 1 inch.

71. Macaria bolina, n. sp.

Poona, October, November, and December; Bombay, November.

Near *M. falsaria*, Walker.

Pale bone-coloured, distinctly irrorated with brown and grey atoms, a small brown spot at the end of each cell, and black marginal points to all the wings; costal border grey; male with a central and a discal thin band, reddish grey, across both wings; with a minutely sinuated darker line running through the latter; female without the central band and with the outer band slightly broader, and with the space outside this band of a darker and redder tinge. I have one male example which also shows this marginal reddish tinge; but the males are generally without it.

Expanse of wings $1\frac{3}{10}$ inch.

72. MACARIA INFRICTARIA, n. sp.

Poona, October and November.

Allied to *M. falsaria.*

Bone-colour, irrorated and striated with reddish grey; top of the head white; thorax with a brown line in front; a brown dot at the end of each cell; costa of fore wings reddish grey, a broad, nearly straight discal band of the same colour across both wings, with the space between this band and the outer margin densely irrorated; marginal points black. Underside whitish, with the dots and band showing through.

Expanse of wings $\frac{8}{10}$–$\frac{9}{10}$ inch.

FIDONIIDÆ.

73. STERRHA SACRARIA.

Phalæna-Geometra sacraria, Linn. Syst. Nat. i. 2. 863, 220.

Poona, October.

ZERENIIDÆ.

74. RHYPARIA TRANSECTATA.

Rhyparia transectaria, Walker, xxiv. 1112.

Khandalla.

75. ABRAXAS FASCIARIA.

Zerene fasciaria, Guérin, Voy. Deless. Hist. Nat. p. 96, pl. 26. f. 5.

Belgaum.

76. HYBERNIA HIBERNARIA, n. sp. (Plate LVI. fig. 4.)

Bombay, December.

Pale purplish grey, densely irrorated with soot-brown; antennæ black, with the branches grey. Wings with a black spot at the end of each cell; the markings, such as they are, are mostly formed by the deneness of the irrorations, making the costa and outer third of the fore wings dark brownish and showing traces of a medial line on the hind wings; the costa is also brown; there is an indication of an antemedial and of a medial line, and the marginal band attenuated towards the anal angle is fairly well defined. The underside is the same as the upper side, with the marginal band of the hind wings almost as broad as on the fore wings.

Expanse of wings $1\frac{4}{10}$ inch.

LARENTIIDÆ.

77. LYCAUGES ALBATUS, n. sp. (Plate LVI. fig. 5.)

Poona, October.

White, suffused here and there with very pale pinkish grey, irrorated with grey and black atoms; antennæ white, with pale grey branches; top of the head pure white; thorax with a black line in front. Both wings with the marginal points black, and with a black spot or mark at the hinder and anal angles; fore wings with two very faint discal lines. Underside white, with a very faint discal line.

Expanse of wings $\frac{9}{10}$ inch.

78. Eupithecia testacea, n. sp. (Plate LVII. fig. 15.)

Poona, October.

Pale greyish testaceous, irrorated with brown atoms; fore wings with inner, medial, and outer black lines rounded towards the costa and bent inwards on to the costal margin; two black spots on the inner line, one on the hinder margin and the other subcostal; costal line blackish, two other very faintly indicated lines between the postmedial line and the margin. Hind wings with a black spot on the end of the cell; antemedial, postmedial, and outer indistinct lines corresponding to those on the fore wings, but more sinuous, a blackish suffusion in the centre of the antemedial line; fringe pale yellowish with brown spots on the tips.

Expanse of wings $\frac{6}{10}$–$\frac{7}{10}$ inch.

79. Eupithecia conscensa, n. sp. (Plate LVII. fig. 8.)

Poona, November and December.

Pinkish grey, irrorated with black atoms, top of the head pure white: wings with a black dot at the end of each cell; three dentated, incomplete, blackish lines, the first commencing near the base, the second in the middle, and the third on the outer two thirds of the hinder margin; the first two meet in the centre of the costa, the second one curving inwardly round the black dot, the third ends on the outer two thirds of the costa; there is also a brownish apical streak or mark. Hind wings with three hardly dentated lines, the first two corresponding to the second and third of the fore wings; the last submarginal. Both wings with the marginal points black; fringe pale pinkish with brown spots.

Expanse of wings $\frac{8}{10}$ inch.

80. Eupithecia bilinea, n. sp. (Plate LVII. fig. 7.)

Poona, October. Very plentiful.

Allied to *E. immixtaria.*

Pale pinkish grey, irrorated with brown atoms; top of the head white; wings with a black spot at the end of each cell; fore wings with two distinct brown, slightly sinuous lines, one antemedial, stopping short of the costa, the other postmedial, complete, bent inwards near the costa; marginal and submarginal lines brownish, indistinct. Hind wings same as fore wings, except that the antemedial line is wanting.

Expanse of wings $\frac{6}{10}$ inch.

Erosiidæ.

81. Erosia theclata.

Erosia theclata, Guénée, Phal. ii. 36.
Erosia adjutaria, Walker, xxiii. 849.
Poona, July.

82. Orudiza protheclaria.

Orudiza protheclaria, Walker, xxiii. 858.

Poona, August.

Euschemidæ.

83. Euschema palmyra.

Phalæna-Bombyx palmyra, Stoll, Suppl. Cram. Pap. Exot. v. p. 159, pl. 36. fig. 1.

Matheran, December.

84. Euschema malayana.

Hazis malayanus, Guérin, Voy. Delessert, Hist. Nat. p. 89, pl. 23. fig. 2.

Khandalla, December: Matheran, December.

Both the above fly by day as well as by night. The forests on the Matheran mountains, 2000 feet elevation, in December 1877 were full of both kinds; they were in wonderful numbers all over the forests, flying through the trees, keeping generally to the upper parts; for the ten days I remained there the numbers did not apparently at all diminish.

Pyrales.

Pyraliidæ.

85. Pyralis lucillalis.

Pyralis lucillalis, Walker, xvii. 268.

Poona, November and December.

86. Pyralis gerontesalis.

Pyralis gerontesalis, Walker, xix. 896.

Poona, May; Bombay.

87. Pyralis suffusalis.

Endotricha suffusalis, Walker, xvii. 390.

Poona, June.

88. Pyralis tenebrosalis.

Pyralis tenebrosalis, Walker, xxxiv. 1235.

Poona, December.

89. Pyralis rubicundalis, n. sp.

Poona, May and October.

Antennæ, palpi, head, and abdomen reddish testaceous; thorax and fore wings dark red; reniform spot brown; a discal, sinuous, reddish-brown line, and the space between this line and the outer border paler than the rest of the wing: hind wings whitish testaceous; both wings with the marginal border reddish brown, with brown marginal points; fringe pale pinkish luteous, interrupted with reddish brown.

Underside pale reddish testaceous, with the costa of both wings reddish ; base of both wings suffused with deep red, with the discal line and reniform mark of the fore wings distinctly visible.

Expanse of wings $1\frac{1}{10}$ inch.

90. PYRALIS ROBOREALIS, n. sp. (Plate LVII. fig. 1.)

Bombay, September.

Dark rufous-brown ; stout palpi and head pale rufous ; abdomen dark brownish black, with paler segmental stripes ; wings irrorated with black ; fore wings rufous-brown, shining, with a black reniform mark, a black sinuous interior line, inwardly edged with pale pinkish testaceous, and an outward black sinuous line, outwardly edged with pale pinkish testaceous. Hind wings blackish brown, with an outer, pale sinuous line, corresponding to the outer line on the fore wings; fringe of both wings pinkish, edged with brown. Underside paler, with the markings showing through.

Expanse of wings $1\frac{1}{10}$ inch.

91. PYRALIS QUISQUALIS, n. sp. (Plate LVII. fig. 11.)

Poona, October.

Antennæ, palpi, and head pale pinkish testaceous, marked with brown; thorax rufous-brown; abdomen testaceous: fore wings shining, pinkish grey, irrorated with blackish brown, the irrorations packed into a diffuse shade near the base ; a broad black band occupies the centre of the wing, broadly on the costa, bends inwards on its outer side, and narrows downwards on to the hinder margin. Hind wings whitish testaceous, with a central, incomplete, pale brownish line ; marginal points of both wings black. Underside pale pinkish testaceous, with the black marginal points very distinct ; a brown longitudinal central streak on the fore wings, from the base, joining a postmedial incomplete band, which meets it from the costa ; hind wings with an interior brown spot, and with an incomplete, central, pale brown suffused line or band.

Expanse of wings $\frac{9}{10}$ inch.

92. PYRALIS ZIZANIALIS, n. sp. (Plate LVII. fig. 12.)

Bombay, July and September.

Pinkish-white, suffused with brown ; antennæ and palpi brown ; head, thorax, and abdomen pinkish white, the abdomen with brown segmental bands ; fore wings pinkish white, suffused with brown ; costal line brown, reniform, with a brown ringlet ; a thin interior, and similar submarginal brown band, inclining outwardly, with their upper portions curved inwardly to the costa. Hind wings white, grey towards the outer border. Both wings with the marginal points brown ; fringe interlined brown, white, and brown.

Expanse of wings $\frac{6}{10}$ inch.

93. PYRALIS XYLINALIS, n. sp. (Plate LVII. fig. 17.)

Poona, October.

Palpi brown ; antennæ brown above, whitish beneath ; head rufous ; thorax and abdomen blackish ; fore wings deep black, shining; a pure white mark on the costa at one third from the apex, a pinkish-white spot on its inner side, a pure white spot on the inner side of, and below, this spot; a pinkish-white straight line, inclining outwards from the hinder margin at one third from the base, and terminating at one third from the costa; also a discal, complete, sinuous, very indistinct, pale line. Hind wings testaceous, blackish towards the outer border. Both wings with the marginal line black; fringe interlined, in four parts—whitish, black, whitish, and black.

Expanse of wings $\frac{6}{10}$ inch.

94. Pyralis recisalis, n. sp.

Sattara, June.

Pinkish grey, irrorated with testaceous atoms: fore wings with interior and exterior sinuous, black, thick lines, upright, both curving outwardly in their centres, the outer line more so than the inner, and thickening on the costa. Hind wings whitish towards the base, unmarked; marginal points brownish; fringe pale pinkish white. Underside pale pinkish testaceous, shining, unmarked.

Expanse of wings $\frac{8}{10}$ inch.

95. Arrade massalis, n. sp. (Plate LVII. fig. 10.)

Bombay.

Palpi, head, thorax, and fore wings brown, spotted and marked with pale pinkish yellow; fore wings with the reniform pinkish yellow, lined with a black ring; three black lines, the first subbasal, zigzag, outwardly margined with white, the second antemedial, dentated inwardly near the hinder margin and lined with white on each side, the third postmedial, slightly sinuous, bent outwards outside the reniform spot, and is outwardly lined with white; a black sinuous line between the two last-mentioned lines; a whitish incomplete submarginal line; some black discal streaks and black marginal lunules; marginal line pale pinkish yellow; fringe brown. Hind wings pale pinkish testaceous; marginal line brown; fringe pale pinkish yellow interrupted with brown.

Expanse of wings $\frac{9}{10}$ inch.

96. Cledeobia hypotialis, n. sp.

Poona, October and November.

♂ pinkish grey; ♀ yellowish testaceous; abdomen with brown segmental bands; fore wings brownish towards the costal portion; reniform spot brown, in some specimens large and distinct, in others very small and hardly visible; interior and exterior outwardly oblique, thin, brown bands, the latter inclining towards and near the apex, both of them turning slightly inwards on to the costa; in one example of a male in my collection the outer band is black, rather broad, and has a pure white outward margin. Hind wing with a discal line corresponding to the outer band of the fore wings. Both wings with brown marginal points and with an interlined fringe, white, brown, and white.

Expanse of wings, ♂ $\frac{8}{10}$ inch, ♀ 1 inch.

ENNYCHIIDÆ.

97. PYRAUSTA STULTALIS.

Botys stultalis, Walker, xviii. 669.

Poona, November and December; Bombay, November and December.

98. PYRAUSTA ABRUPTALIS.

Asopia abruptalis, Walker, xvii. 371.

Poona, December; Bombay, November.

ASOPIIDÆ.

99. HYMENIA FASCIALIS.

Phalæna-Pyralis fascialis, Cram. Pap. Exot. iv. 236, pl. 398. f. O.

Sattara, June; Poona, Feb., Aug., and Oct.; Bombay, July to November.

A very common insect; flies by day.

100. COPTOBASIS OPISALIS.

Desmia opisalis, Walker, xvii. 346.

Poona, September to December; Bombay, October and November.

101. COPTOBASIS LUNALIS.

Botys lunalis, Guénée, Delt. et Pyral. 352, 417.

Bombay, October and November.

102. COPTOBASIS ÆNEALIS, n. sp.

Poona, July; Bombay, July and August.

Allied to *C. opisalis,* Walker.

Pale bronzy black, head and thorax with silvery-grey speckles, abdomen with whitish segmental bands; a white interior sinuous band, which commences on the abdominal margin of the hind wings, near the anal angle, is disjointed at one third from the costa, then expands on to the costa in a large white spot, and is lined internally on this wing with blackish; it continues unbroken up the fore wing, stops short of the costa, and is lined externally on this wing with blackish, and this blackish line touches the costa, and this is followed on the fore wing by a white subcostal spot close to it; there is a white, sinuous, medial band, which commences one third from the abdominal margin, and close to the other band, stops short of the costa, then is continued up the fore wing (with one break), stops short of the costa, is margined inwardly throughout with blackish, except the last disjointed piece near the costa of the fore wings, which is margined with blackish on each side, and above this there is a minute subcostal white dot; there is another white discal band on the fore wings only, which commences short of the hinder margin, expands towards and stops short of the costa, and is margined inwardly with blackish. Underside same colour as upper side, with the bands less distinct, and the inner band almost obsolete on the fore wings.

Expanse of wings $\frac{9}{10}$–1 inch.

103. ENDOTRICHA RHODOPHILALIS.

Endotricha rhodophilalis, Walker, xxxiv. 1311.

Bombay, November.

104. SAMEA INSCITALIS.

Ædiodes inscitalis, Walker, xxxiv. 1297.

Poona, November.

105. ÆDIODES EFFERTALIS.

Ædiodes effertalis, Walker, xvii. 348.

Bombay.

106. ASOPIA LATIMARGINALIS.

Asopia latimarginalis, Walker, xvii. 370.

Bombay, October.

107. ASOPIA TORRIDALIS.

Asopia torridalis, Lederer, Wien. Ent. Mon. vii. 342, 457, pl. 6. fig. 15.

Bombay, September.

This insect does not belong to this genus, it does not properly fit into any known genus; it appears in great quantities in Bombay in September.

108. LEUCINODES ORBONALIS.

Leucinodes orbonalis, Guénée, Delt. et Pyral. 223, 187.

Poona, November and March; Bombay.

109. AGATHODES OSTENTALIS.

Perinephela ostentalis, Geyer, Zutr. Samml. Exot. Schmett. x. 417, figs. 833, 844.

Bombay, September.

The southern form is uniformly smaller than those taken in the north of India; but though so much smaller as to make it look at first sight like another species, it proves on examination to be (except in its size) identically the same.

HYDROCAMPIDÆ.

110. CATACLYSTA DILUCIDALIS.

Botys dilucidalis, Boisd., Guér. Règn. Anim. Icon. Ins. pl. 90. f. 7.

Bombay.

111. CATACLYSTA HALIALIS.

Cataclysta halialis, Walker, xvii. 447.

Poona, December.

112. PARAPONYX AFFINIALIS.

Paraponyx affinialis, Guénée, Delt. et Pyral. 278, 259.

Poona, October.

113. Hydrocampa tenera.

Hydrocampa tenera, Butler, P. Z. S. 1883, p. 167.

Poona, November.

114. Hydrocampa depunctalis.

Hydrocampa depunctalis, Guéneé, Delt. et Pyral. 274, 265.

Bombay, November.

115. Hydrocampa scitalis, n. sp.

Bombay, September to November. Very common.

Pure silvery white; thorax with four or five chocolate-brown spots; head with a similarly coloured mark down its centre; abdomen with black segmental bands. Wings with all the markings chocolate-brown and very distinct; fore wings with orbicular and reniform ringlets, a subbasal incomplete double line, an antemedial line across both wings, terminating on the costa, inside and close to the orbicular; a discal line on the fore wings, commencing on the costa, at one third from the apex, straight across on to the outer margin near the hinder angle; it then curves inwardly, touching the bottom of the reniform ringlet (which is large, and extends from this line nearly to the costa), bends down and touches the hinder margin, at one third from the angle, then curves inwardly again, keeping close to the margin, and joins the antemedial line on the margin; on the hind wing there is also a similar discal line, which commences from the costa, at one third from the apex, straight down to the outer margin, above the anal angle, then curves upwards and inwards, and joins the antemedial line, a little below its centre; there is also a marginal line on both wings. Underside dull white, with the markings indistinct.

A very beautiful little insect.

Expanse of wings $\frac{4}{10}$–$\frac{5}{10}$ inch.

116. Isopteryx enixalis, n. sp.

Bombay.

Antennæ, palpi, head, and thorax greyish brown; thorax spotted with white in front, and marked with white on each side; abdomen with a duplex brown stripe across each segment. Wings pure white marked with brown, the fore wings so thickly marked as to make them appear brown, with the base whitish, with two antemedial white bands, with reniform and orbicular brown spots, surrounded with white, a medial patch of whitish, and brown lines, confused together and impossible to describe, and a marginal white band. Hind wings white, with an inner incomplete brown diffused band, followed by a white line and a thin brown line, all so to speak making one band; an outer thin black line, followed by a white line, then a broad incomplete brown band, these three also making one broad discal band, the white space between the two bands with a brownish mark in the centre. Both wings with marginal spots, and a white fringe. Underside white, diffused with brownish in the centre of the fore wings.

Expanse of wings $\frac{7}{10}$ inch.

Spilomelidæ.

117. Salbia perspicualis.

Zebronia perspicualis, Walker, xxxiv. 1347.
Poona, July, September, October, and December.

118. Zebronia abdicalis.

Zebronia abdicalis, Walker, xvii. 480.
Bombay.

119. Zebronia salomealis.

Zebronia salomealis, Walker, xvii. 476.
Botys multilinealis, Guénée, Delt. et Pyral. 337, 380.
Poona, September and October ; Bombay, October and November.
The larvæ feed on the cotton-plant.

120. Zebronia amyntusalis.

Botys amyntusalis, Walker, xviii. 662.
Bombay.

121. Zebronia aurolinealis.

Zebronia aurolinealis, Walker, xvii. 478.
Bombay.

122. Phalangiodes neptalis.

Phalæna-Noctua neptis, Cram. Pap. Exot. iii. 128, pl. 264. f. E.
Nansinoë neptalis, Hübner, Verz. Schm. 363, 3466.
Bombay, September, October, and November.

Margaroniidæ.

123. Pygospila tyresalis.

Phalæna-Pyralis tyres, Cram. Pap. Exot. iii. 124, pl. 263. f. C.
Pygospila tyresalis, Guénée, Delt. et Pyral. 312, 340.
Poona, July and October ; Bombay, July, August, and November.

124. Pygospila costiferalis.

Pygospila costiferalis, Guénée, Delt. et Pyral. 313, 341.
Poona, July and October ; Bombay, October.
Very plentiful in Bombay in October.

125. Phakellura indica.

Eudioptis indica, Saunders, Zool. ix. 3070.
Poona, August and October ; Bombay, August to November.
Very common.

126. Maruca aquatilis.

Hydrocampa aquatilis, Boisd., Guér. Icon. Règn. Anim. Ins. pl. 90. f. 9.
Poona, September, October, and December.

127. Noorda blitealis.

Noorda blitealis, Walker, xix. 979.

Poona, November; Bombay, July and August, October to December.

Only one taken in Poona; very common in Bombay.

128. Cydalima submarginalis.

Botys submarginalis, Walker, xxxiv. 1414.

Bombay, December.

The only example taken is rather worn, and is a little smaller than the type. The submarginal pale line on the fore wings is not observable; but in all other respects it is identical.

129. Cydalima conchylalis.

Margarodes conchylalis, Guénée, Delt. et Pyral. 303, 317.

Poona, October and November; Bombay, September.

130. Margaronia phryneusalis.

Margaronia phryneusalis, Walker, xviii. 531.

Bombay.

131. Margaronia pomonalis.

Margaronia pomonalis, Guénée, Delt. et Pyral. 309, 334.

Poona, October; Bombay, September.

132. Margaronia maliferalis.

Margaronia maliferalis, Walker, xxxiv. 1363.

Bombay, October.

133. Margaronia vertumnalis.

Margarodes vertumnalis, Guénée, Delt. et Pyral. 309, 333.

Belgaum; Poona, August; Bombay, August to November. Very common.

134. Margaronia celsalis.

Botys celsalis, Walker, xviii. 654.

Poona, July.

135. Margaronia brizoalis.

Margaronia brizoalis, Walker, xix. 976.

Poona, October; Bombay, November.

136. Glyphodes parvalis.

Glyphodes parvalis, Walker, xxxiv. 1355.

Poona.

137. Glyphodes actorionalis.

Glyphodes actorionalis, Walker, xvii. 498.

Bombay, October.

138. Glyphodes diurnalis.

Glyphodes diurnalis, Guénée, Delt. et Pyral. 294, 300.

Bombay, August and September.

139. Glyphopes univocalis.

Glyphodes univocalis, Walker, xvii. 499.

Bombay.

140. Glyphodes luciferalis.

Botys luciferalis, Walker, xxxiv. 1412.

Bombay.

141. Euglyphis fulvidorsalis.

Pinacia fulvidorsalis, Geyer, Zutr. Samml. Exot. Schm. 15. 322. figs. 643, 644.

Belgaum, September.

142. Euclasta defamatalis.

Ilurgia defamatalis, Walker, xviii. 544.

Bombay, November.

"Botididæ."

143. Dyssallacta negatalis.

Phalangiodes negatalis, Walker, xvii. 468.

Bombay, July.

144. Rehimena dichromalis.

Rehimena dichromalis, Walker, xxxiv. 1492.

Bombay.

145. Astura semifascialis.

Astura semifascialis, Walker, xxxiv. 1381.

Poona, November.

The type is labelled "Moreton Bay." This beautiful little insect is so distinctly marked, there can be no mistake as to its identity.

146. Astura punctiferalis.

Astura punctiferalis, Guénée, Delt. et Pyral. 320, 347.

Bombay, October.

147. Astura festivalis, n. sp.

Bombay, August.

Bright chrome-yellow, thorax with a black spot on each side, fore legs with black bands; wings with the spots and markings purplish brown; fore wings with a spot on the costa, near the base, a reniform spot, and an antemedial band; hind wing with a subcostal spot near the base. Both wings with a discal curved band, and a broad marginal band.

Underside dull pale chrome-yellow, marked same as the upper side, except that the spot on the costa of the fore wings and the inner band are absent.

Expanse of wings $1\frac{2}{10}$ inch

148. Botyodles asialis.

Botyodles asialis, Guénée, Delt. et Pyral. 321, 348.

Bombay, July to November.

Very common. I have also a variety from Belgaum, which is pure chrome-yellow, without any markings.

149. Botys plagiatalis.

Botys plagiatalis, Walker, xviii. p. 673.

Poona, November.

150. Botys aurea.

Botys aurea, Butler, Ill. Typ. Lep. Het. iii. 76, pl. 59. f. 11 (1879).

Poona, November; Bombay.

151. Botys incoloralis.

Botys incoloralis, Guénée, Delt. et Pyral. 332, 369.

Poona, September and November; Bombay, September and October.

152. Botys iolealis.

Botys iolealis, Walker, xviii. 666.

Bombay, November.

153. Botys thyasalis.

Botys thyasalis, Walker, xviii. 734.

Bombay, October.

154. Botys abstrusalis.

Botys abstrusalis, Walker, xviii. 663.

Poona, July, September, and October; Bombay, July and September.

155. Botys tropicalis.

Botys tropicalis, Walker, xviii. 670.

Bombay.

156. Botys pharisalis.

Botys pharisalis, Walker, xviii. 726.

Poona, September and October.

The type is marked Moreton Bay; it is a common insect in Poona.

157. Botys sublituralis.

Botys sublituralis, Walker, xxxiv. 1452.

Bombay, October.

158. Botys ablactalis.

Botys ablactalis, Walker, xviii. 660.

Poona, November.

The only specimen of this fine species taken by me at Poona has a distinctly greenish tinge.

159. Botys idyalis.

Botys idyalis, Walker, xix. 996.

Bombay, November.

160. Botys epastalis, n. sp. (Plate LVII. fig. 13.)

Bombay.

Allied to *B. albifimbrialis*, Walker, from Java.

Ochraceous ferruginous, stout, whitish, and shining beneath; palpi and body white beneath, abdomen extending for one third beyond the wings; wings opaque, moderately broad; fore wings with three denticulated brown lines, first antemedial complete and nearly straight, second medial upright and stopping short of the costa, third discal much bent outwardly from the costa, and stops at two thirds of the breadth of the wing; hind wings with two faint lines, corresponding to the first and second lines of the fore wings, the first line almost invisible, except by a mark near the costa, the second more distinct, and very much bent outwardly; all the lines tinged with pale reddish outwardly, marginal line pale reddish; fringe brown, tipped with white.

Expanse of wings 1 inch.

161. Ebulea catalaunalis.

Botys catalaunalis, Duponchel, Lep. de France, viii. p. 330, pl. 232, f. 8.

Botys venosalis, Walker, xxxiv. 1401.

Poona, September, October, and November; Bombay, September and October.

162. Spilodes rhodocryptalis.

Spilodes rhodocryptalis, Walker, xxxiv. 1474.

Poona, December.

The type is marked Moreton Bay; it is a common insect in many parts of India.

163. Scopula damastesalis.

Scopula damastesalis, Walker, xix. 1013.

Poona, October, November, and December.

164. Scopula eximialis.

Scopula eximialis, Walker, xxxiv. 1471.

Bombay, October.

165. SCOPULA FOTALIS, n. sp. (Plate LVII. fig. 9.)

Poona, October.

Pinkish cinereous, body pinkish brown, abdominal segments whitish; wings irrorated with pinkish brown, and with all the markings of that colour. Fore wings with a reniform streak, with two subcostal spots, one near the centre, and the other on its inner side, a mark at the centre of the hinder margin, like the commencement of a band, a discal, outwardly bent, thick line, terminating with a large spot on the costa; marginal portion of the wing dark, marginal points blackish. Hind wings brown, fringe of both wings yellowish. Underside very pale pinkish, with a brownish medial band across both wings.

Expanse of wings $\frac{7}{10}$ inch.

166. DEBA MILVINALIS, n. sp. (Plate LVII. fig. 2.)

Poona, November; Bombay.

Rufous brown. Fore wings darker brown towards the outer and hinder margins; reniform mark black; two deep black bands, the first, at one third from the base, narrow, rounded outwardly, and stops at one third from the hinder margin, the other discal, broad, straight, halfway downwards from the costa, then is much bent inwardly and stops short of the hinder margin; marginal line brown; fringe white, with the upper half diffused with brown. Hind wings brown, with a central curved line mostly composed of black dots; fringe white. Underside pale silvery cinereous, with a medial curved line of brown dots running through both wings.

Expanse of wings $1\frac{4}{10}$ inch.

167. GODARA COMALIS.

Pionea comalis, Guénée, Delt. et Pyral. 368–453.

Sattara, February.

168. PACHYNOA PECTINICORNALIS.

Botys pectinicornalis, Guénée, Delt. et Pyral. 326–351.

Poona, November; Bombay.

STENIADÆ.

169. DIASEMIA GEOMETRALIS.

Lepyrodes geometralis, Guénée, Delt. et Pyral. 278, 271.

Poona, October; Bombay.

170. STENIA ELUTALIS.

Cataclysta elutalis, Walker, xvii. 448.

Poona, October; Bombay, November.

171. MICROSCA STRIATALIS, n. sp.

Bombay, December.

Pale pinkish white, suffused with reddish fawn-colour; palpi with white tips; palpi, antennæ, head, and thorax fawn-colour; thorax darkest in front; abdomen pale fawn-colour, with some silvery markings on the basal half. Fore wings with the costa dark reddish fawn-colour; both wings suffused with fawn-colour, and covered with striations of the same colour, some of which are more or less connected and form eleven or twelve striated lines across both the wings; reniform whitish in some specimens, with a brown ring in others, merely indicated by a black point, sometimes obsolete; marginal points brown; fringe reddish. Underside with the striations formed into regular lines, crossing the wings, and darker than they are above. It is rather a variable insect. I have one with the striations above on the centre of the hind wing blackish, making the wing look as if it had a central indistinct band.

Expanse of wings $\frac{5}{10}$–$\frac{6}{10}$ inch.

Scopariidæ.

172. Stenopteryx hybridalis.

Pyralis hybridalis, Hübner, Pyral. 29, 20, pl. 17, f. 114.

Poona, October, November, and December.

Very common; a common variety at Poona is reddish-coloured, with only very faint tracings of the usual wing-markings.

173. Dosara cœlatalis.

Dosara cœlatalis, Walker, xix. 829.

Poona, February and November.

174. Scoparia ictericalis, n. sp. (Plate LVII. fig. 16.)

Poona, November and December.

Yellowish white, irrorated with grey. Fore wings with the irrorations mostly in streaks, with two outwardly curved lines, one antemedial, the other discal, an indication of another line between these two in some specimens; marginal border with the irrorations thickened into a band, with the inner side dentated. Hind wings testaceous, basal portion whitish, marginal points black; fringe interlined white and grey.

Expanse of wings $\frac{7}{10}$ inch.

Galleriidæ.

175. Melissoblaptes depressellus, n. sp. (Plate LVII. fig. 5.)

Poona, October.

Antennæ and palpi greyish yellow; thorax grey, with a brown band in front; abdomen whitish. Fore wings greyish yellow, irrorated with grey, with the irrorations intensified into pale streaks on the costa, in the centre and on the hinder margin, also some grey streaks on the veins, on the marginal border. Hind wings pure white, unmarked.

Expanse of wings $1\frac{2}{10}$ inch.

176. Lamoria planalis.

Lamoria planalis, Walker, xxvii. 88.

Poona, December; Bombay, November.

PHYCIDÆ.

My large collection of Phycidæ must stand over until M. Ragonot publishes his monograph on this genus; nearly all the types from private collections in England appear to be now in his possession in Paris.

177. HOMŒOSOMA GRATELLA.

Homœosoma gratella, Walker, xvii. 26.

Poona, October and November; Bombay.

178. HOMŒOSOMA DERASELLA, n. sp. (Plate LVII. fig. 19.)

Poona, September; Bombay, October.

Reddish cinereous, irrorated with grey; palpi and head marked with white. Fore wings with the costa greyish, with two incomplete blackish bands, inwardly oblique, one antemedial, the other medial, both stopping short at one third from the costa, two incomplete, very indistinct, reddish discal lines, absent in some specimens. Hind wings whitish grey towards the outer margin; fringe interlined white and grey.

Expanse of wings $\frac{6}{10}$ inch.

179. NEPHOPTERYX LENTALIS, n. sp. (Plate LVII. fig. 18.)

Bombay.

Antennæ, palpi, head, and thorax dark pinkish grey, marked with brown; abdomen pale grey, with blackish segmental bands. Fore wings white, with a slight tinge of pinkish, irrorated with pinkish brown atoms, a grey basal band with a black mark in it, a medial grey band broad on the hinder margin, and narrowing to the costa, with the upper half black, a black apical diffuse streak and a white line near the outer margin, crossing the apical streak and running through a diffuse blackish band; marginal points black; fringe grey. Hind wings whitish; marginal line grey; fringe interlined white and grey.

Expanse of wings $\frac{8}{10}$ inch.

180. NEPHOPTEYRX LAXALIS, n. sp.

Poona, November.

Antennæ, palpi, head, thorax, and fore wings yellowish brown; abdomen grey; hind wings whitish. Fore wings with the costa grey, with a broad, diffuse, subcostal grey band, which occupies nearly the upper half of the wing and expands on the outer margin, having a large spot of the ground-colour of the wings in its centre; hinder margin also suffused with grey. Hind wings whitish, unmarked. Underside whitish testaceous, shining, unmarked.

Expanse of wings $\frac{8}{10}$ inch.

181. NEPHOPTERYX CREPERALIS, n. sp. (Plate LVII. fig. 20.)

Poona, October.

Greyish brown, irrorated with black atoms; abdomen (especially in the female) with whitish segmental lines. Fore wings with the costa brownish, and with two brown bands, one antemedial, nearly straight, the other postmedial, and oblique, ending on the costa near the apex; marginal points black; fringe interlined in five parts white and brown. Hind wings paler than the fore wings, with a faint postmedial line. Underside testaceous, with a postmedial line through both wings.

Expanse of wings, ♂ 1, ♀ $1\frac{2}{10}$ inch.

Crambidæ.

182. Chilo lincusalis.

Homœosoma?? lincusalis, Walker, xxvii. 26.

Poona, June.

183. Chilo cervinellus.

Chilo cervinellus, Moore, P. Z. S. 1872, p. 581, pl. 34. f. 7.

Sattara, June; Matheran, May.

184. Chilo gratiosellus.

Chilo gratiosellus, Walker, xxx. 967.

Poona, November; Bombay, October.

185. Chilo interruptellus.

Chilo interruptellus, Moore, P. Z. S. 1872, p. 581, pl. 34. fig. 5.

Poona, June.

186. Chilo aurifusellus.

Crambus aurifusellus, Walker, xxxv. p. 1756.

Poona, October.

187. Schœnobius bisignatus.

Schœnobius bisignatus, Zeller, MS. (Coll. B.M.).

Poona, October.

Pale yellowish cream-colour, shining, with a slight suffusion of pinkish. Fore wings with costa and apex pinkish; costa blackish near the base, a black spot at the end of the cell and another above the hinder margin, a little inside of its centre. Hind wings white. Underside same as upper side but duller.

Expanse of wings, ♂ $\frac{6}{10}$, ♀ $\frac{7}{10}$–$\frac{8}{10}$ inch.

188. Catagela admotella.

Catagela admotella, Walker, xxvii. 192.

Poona, December.

Charltona, gen. nov.

Male and female. Fore wings long, narrow, exterior margin obliquely convex, posterior margin convex towards the base; cell extending two thirds the length; first subcostal emitted at three fifths before end of the cell, second and third close to end, third bifid; discocellular slender, inwardly oblique, slightly bent near each end, radials from the angles; middle median at one eighth before end of cell, lower at three fifths; submedian straight. Hind wings long, exterior margin very oblique, convex, abdominal margin short; cell extending half the length; subcostal curved upward from end of cell, and slightly touching the costal; discocellular slender, bent outward in middle, lower end longest and very oblique, radial from middle of upper end, two upper medians from acute end of cell, second from near the end, first or lower at nearly one half before the end; submedian and internal vein wide apart. Body long, slender, abdomen slightly tufted at tip; labial palpi porrect, compressed at the sides, lanceolate, laxly squamose beneath, extending half their length beyond the eyes; maxillary palpi tufted in front; proboscis slender; antennæ in male stoutly bipectinated, the branches minutely ciliated; antennæ in female setose; legs moderately slender, middle and hind spurs slender.

189. CHARLTONA KALA, n. sp. (Plate LVII. fig. 4, ♂.)

Sattara, June.

Male and female. Wings glossy. Fore wings fuliginous black. Hind wings pale brownish cinereous. Thorax, head, palpi, and fore legs fuliginous black; abdomen, middle and hind legs brownish cinereous, anal tuft fuliginous brown; antennæ ochreous in male, black in female.

Expanse of wings, ♂ $1\frac{1}{10}$, ♀ $1\frac{5}{10}$ inch.

190. EROMENE BELLA.

Eromene bella, Hübner, Tin. f. 69.

Poona, November.

191. SURATTHA INVECTALIS.

Surattha invectalis, Walker, xxvii. p. 76.

Sattara, June; Poona, June.

192. CRAMBUS PARTELLUS, n. sp.

Poona, October and November; Bombay, September and November. In great quantities at Poona.

Allied to *C. desistalis*, Walker. Pinkish white, irrorated with grey and black atoms. Fore wings with the irrorations (which are always darker and denser in the male than in the female) making the costal portion dark, and forming two irregular, diffuse, very oblique bands across the wing, one before the middle and the other beyond it, and running up to the apex; there is sometimes also a black dot at the end of the cell. Hind wings pure white. Underside pure white, with some diffuse grey colour in the interior of the fore wings of the male; pure white and unmarked in the female.

Expanse of wings, ♂ $\frac{8}{10}$–1 inch, ♀ $1\frac{2}{10}$–$1\frac{5}{10}$ inch.

193. JARTHEZA CHRYSOGRAPHELLA.

Chilo chrysographella, Kollar, Hügel's Kaschmir. p. 494 (1848).

Poona, September and October.

194. Jartheza obstitella, n. sp. (Plate LVII. fig. 3, ♀.)

Poona, June.

Allied to the preceding. Yellowish fawn-colour; antennæ black, two black stripes on each tegula; abdomen and hind wings pure white. Fore wings with the costa black, a straight whitish silvery uniform stripe in the centre of the wing, from the base to one third from the outer margin; a black stripe adjoining and below this, and extending in a fine point to the outer margin, and with a break in it about the end of the white stripe; there are also some blackish diffuse stripes above the white stripe, and some more on the outer portion of the wing; a sinuous interrupted, duplex, black band near the outer margin, a row of black, submarginal spots, and a black marginal line, which goes round the angle and extends a short way in the hinder margin.

Underside white, with the interior of the fore wings suffused with pale brownish.

Expanse of wings $1\frac{4}{10}$ inch.

195. Metasia candidulalis, n. sp. (Plate LVII. fig. 6.)

Poona, September.

Allied to *M. lactealis*, Felder, pl. 137. fig. 38. Pure white; fore wings with a black spot in the centre; base of costa also black; some very fine grey irrorations here and there in the wing, also a few very minute black specks; an antemedial line, composed of three pale orange spots, a discal incomplete, very faint orange-coloured line, commencing with two faint orange spots near the hinder margin, a submarginal line of faint orange-coloured spots more or less joined together. Hind wings unmarked.

Underside unmarked, with the interior of the fore wings suffused with brownish.

Expanse of wings $\frac{9}{10}$ inch.

Nycteolidæ.

196. Earias chromotaria.

Earias chromotaria, Walker, xxvii. p. 204.

Bombay, November.

197. Earias frondosana.

Earias frondosana, Walker, xxvii. p. 204.

A yellow variety, with the green medial stripe on the fore wings absent. Is common at Poona in October, November, and December. Larvæ feed on cotton-pods.

198. Earias simillima.

Earias simillima, Walker, xxxv. p. 1775.

Poona, October and December,

One specimen of this pretty little insect taken in October 1882, and one in December 1883.

199. Earias tristrigosa.

Earias tristrigosa, Butler, P. Z. S. 1881, p. 614.

Bombay.

This paper concludes my list of the Lepidoptera of Bombay and the Deccan. As already stated, I am indebted to Lord Walsingham for working out the specimens of Tortricidæ and Tineina.

Fam. Tortricidæ.

Subfam. Tortricidæ.

Cacœcia, Hb.

200. Cacœcia micaceana.

Cacœcia micaceana, Walker, xxviii. p. 314.

Poona, November.

One female from Poona, very similar in appearance to *Cacœcia podana*, Sc., but differing from that species in possessing a strong tuft of stout closely-set scales on the costal margin of the hind wings.

I have in my own collection three males and four females collected by the Rev. J. H. Hocking at Dharmsala in the Punjab. The males also greatly resemble the European *C. podana*, and are, indeed, less distinguishable from that species than the females, as they lack the structural characters above referred to, differing only in their rather smaller size and less brightly coloured hind wings. The type in the British Museum is a female, which is more conspicuously marked on the fore wings, but has the characteristic tuft on the hind wings strongly developed. Mr. Hocking, to whom I am also indebted for a specimen of the larva, informs me that it lives between the leaves of *Quercus alba*.

Dichelia.

201. Dichelia retractana.

Dichelia retractana, Walker, xxviii. p. 322.

Bombay, October.

A single male is in the collection of Mr. F. Moore, from Ceylon, and a female in Colonel Swinhoe's collection, from Bombay. I have also a single male from the Rev. J. H. Hocking, taken at Dharmsala. Walker's specimen in the British Museum is from Australia, and is undistinguishable from the Ceylonese and Indian examples.

Phycodes, Gn.

202. Phycodes hirudinicornis.

Phycodes hirudinicornis, Guénée, Noct. ii. pp. 389, 1249.

Tegna hyblaella, Walker, xxxv. 1810.

Poona.

I have also received the species, with its larva, from the Rev. J. H. Hocking from Dharmsala. According to the evidence afforded by the structure, appearance, and habits of the larva, which has been lately figured by Mr. Moore in his 'Lepidoptera of Ceylon,' Guénée ('Histoire Naturelle des Insectes,' vi. 389) rightly indicates its affinities by the words "Tortrix voisine des *Endopisa*." I am indebted to Mr. Moore for the suggestion that Guénée's species is the same as *Tegna hyblæella*, Walker, which is undoubtedly the case. Mr. Hocking states that the larva feeds on various leaves, partially rolling and connecting them with silk. The pupa, which has the segments strongly serrated, is enclosed in an irregular-shaped cocoon; and when the perfect insect is developed, the empty pupa-case is found protruding from the cocoon after the manner of the typical Tortricidæ. (This species has been wrongly placed in the Noctuidæ and in the Choreutidæ by different authors.)

DICHRORAMPHA, Guén.

203. DICHRORAMPHA SUBSEQUANA.

Tortrix subsequana, Haworth, Stephens; Wood, f. 1021.

Poona, October.

Ten specimens, all in poor condition, from Poona, some of which are undistinguishable from *D. subsequana*, Haworth, but probably belonging to more than one distinct species. In a genus in which many species present such minute differences of colour and markings, it would only add to the difficulty of study to attempt to describe any but the very best specimens.

204. ALAVONA BARBARELLA.

Alavona barbarella, Walker, xxviii. 515.

Poona, May and June.

Nine males and one female, labelled "*Alavona cossinella*, Walk.," but agreeing better with the type of *A. barbarella*. It is doubtful whether the two species are really distinct, some of the larger and more clearly marked males approaching very closely to certain varieties of *A. cossinella*. The markings, however, are for the most part less clearly defined, the central shade being projected upwards towards the apex of the fore wings rather than towards the anal angle. The fore wings appear to be somewhat narrower, and the difference is also noticeable in the females.

205. ALAVONA COSSUSELLA.

Alavona cossusella, Walker, xxxv. 1816.

Poona, May, June, and July.

Ten males from Poona, labelled "*Alavona intermediella*, Walk.," and ten males, three females, Poona and Mhow, labelled "*Alavona cossusella*, Walk.," appear to me to belong, without exception, to the latter species.

TINEA.

206. TINEA SACERDOS, n. sp.

Bombay, July.

Head, palpi, and antennæ pale ochreous, the latter nearly as long as the fore wings. Thorax dull purplish fuscous, with a tuft of bright yellow ochreous scales posteriorly. Fore wings dull purplish fuscous, cilia the same. Hind wings shining bright purple, the costal margin thickly scaled, pale ochreous, fringes bronzy brown; a fringe of bronzy-brown scales along the basal half of the first vein. Abdomen bright yellowish ochreous. Legs and anal tuft pale ochreous. Underside of all the wings shining purple.

Expanse 33 millim.

A single specimen in Col. Swinhoe's collection, also from Bombay, appears to be allied to the large horn-feeding African species known as *Tinea vastella,* Zeller.

Hapsifera, Zeller.

207. Hapsifera deviella.

Drosica? deviella, Walker, xxviii. 520.

Poona, October and November. In great plenty.

Strongly resembles *Hapsifera luridella,* Zeller, but is lighter in colour and has paler hind wings.

Fam. Plutellidæ.

Cerostoma, Latr.

208. Cerostoma rugosella, Stainton.

Poona, October and December; Bombay, September.

Three specimens from Bombay and Poona agree with Mr. Stainton's description, but I am yet doubtful whether they are rightly identified as belonging to this species, of which I have not seen the type.

Note.—This species may possibly constitute the type of a new genus, which would also include *Morophaga? barbarata* of Christoph.

Hyponomeuta, Zeller.

209. Hyponomeuta malinellus.

Hyponomeuta malinellus, Zeller, Isis, 1844, p. 220.

Poona, December.

A single specimen from Poona is robably the same species noticed by Christoph under this name (Hor. Soc. Ent. Ross. x. p. 51) as occurring in North Persia. The markings are disposed exactly as in European specimens, but the unusually dark colour, much darker than any variety I have before seen, is very remarkable.

210. Atteva niveiguttella.

Corinea niviguttella, Walker, p. 542.

Bombay.

Fam. CRYPTOLECHIADÆ, Meyrich.

DEPRESSARIA?

211. DEPRESSARIA SWINHOEI, Butler, P. Z. S. 1883, p. 174.

Poona, October.

There are five specimens in the collection: they have not the depressed bodies of the genus *Depressaria*, from which the neuration of the hind wings also serves to separate them. The junction of veins 6 and 7 of the hind wings would place them, according to Mr. Meyrich's system of classification, in the Cryptolechiadæ: but the name of this family should perhaps be altered, for I find on examining the type of Zeller's *Cryptolechia straminella* from South Africa, which is the original type of the genus, veins 6 and 7 of the hind wings are not even closely approximated at the base, but run nearly parallel as in Depressariadæ and Œcophoridæ.

BINSITTA, Walker.

212. BINSITTA NIVIFERANA.

Binsitta niviferana, Walker, xxix. 832.

Bombay, October. One female.

GELECHIA.

213. GELECHIA UMBRIPENNIS, sp. nov.

Bombay; Poona, April. Reared from Cawnpore cotton.

Palpi long, recurved, the second joint smoothly scaled, not tufted, pale ochreous, dull umber-brown externally over two thirds of the length of the second joint.

Head, antennæ, thorax, and fore wings dark umber-brown, with two inconspicuous darker spots, the first above and before the middle; the second equidistant from the costal and dorsal margins, at the end of the cell. Abdomen and hind wings pale cinereous (fore and hind wings rather shining); legs pale cinereous.

Expanse, ♂ 15 millim., ♀ 18 millim.

214. CHELARIA INDICA, sp. n.

Bombay.

Head, palpi, and antennæ cinereous. Fore wings fawn-coloured at the base and along the dorsal margins, slightly mottled towards the apex with the darker shading; a large diffuse fuscous costal blotch stretches from the basal third of the wing nearly to the apex, and contains a few raised fuscous scales, especially towards its inner margin, it is interrupted on the costa beyond the middle by an elongate narrow cinereous space. Hind wings are purplish iridescent along their central space, where the scales are very thin, but brownish around the margins, which are more thickly covered; fringes dull cinereous. Legs and abdomen pale cinereous.

Expanse 15 millim.

This species is closely allied to *Chelaria conscriptella*, Hübn., and is the first of this genus described from India. It is represented by a single specimen in Colonel Swinhoe's collection from Bombay.

Aciptilia, Hübner.

215. Aciptilia oxydactyla.

Pterophorus oxydactylus, Walker, xxx. 944.

Poona, September and December. Common.

Undistinguishable from *Pterophorus oxydactylus*, Walker, from Ceylon. Under Walker's name *P. congrualis* from India are two distinct species. The second specimen is at least very closely allied to *P. oxydactylus*, apparently differing only in the markings of the upper side of the abdomen, but the first and third specimens have dark spots in the cilia of the dorsal margin of the fore wings and probably belong to the genus *Mimescoptilus*. Col. Swinhoe's specimens have white marks on the legs as in *P. oxydactylus*.

216. Aciptilia atomosa, n. sp.

Bombay.

Head, thorax, palpi, and antennæ dull fawn-colour, the latter with a slender dark fuscous streak along their upper side towards the base.

Fore wings dull fawn-colour, sprinkled with dark fuscous scales except along the costal portion of the wing. The anterior lobe has three dark fuscous spots on its costal margin at the base of the fringes, the first at about one third of its length from the base of the cleft; the other two closely approximate to each other about half way between the first and the apex of the wing. The fringes are very slightly paler than the wings, and are thickly speckled with dark fuscous dots beneath the apical portion of the anterior lobe and on both sides of the apex of the posterior lobe. In the fringes on the dorsal margin about the middle is a group of dark fuscous spots.

Hind wings pale fawn-brown, cleft to more than half their length, between the first and second lobes. On the dorsal margin of the third lobe is a row of dark fuscous dots along the middle of the fringes. Abdomen dull fawn-colour, with scarcely paler inconspicuous bands at the junction of the segments. Legs dull fawn-colour, with paler spurs; along the underside of each spur runs a dark fuscous line, and on the two anterior pairs of legs these lines are continued along the whole length of the legs themselves.

Expanse 20 millim.

EXPLANATION OF THE PLATES.

Plate LVI.

Fig. 1. *Ephyra quieta*, p. 856.
2. *Chilkasa falcata*, p. 853.
3. *Boarmia gleba*, p. 853.
4. *Hybernia hibernaria*, p. 862.
5. *Lycauges albatus*, p. 862.
6. *Iodis quantula*, p. 855.
7. *Geometra aperta*, p. 855.

Fig. 8. *Comibæna glareosa*, p. 855.
9. *Thalera obnupta*, p. 855.
10. *Ephyra fluidaria*, p. 856.
11. *Idæa grandicularia*, p. 858.
12. *Macaria boaria*, ♂, p. 861.
13. *Zanclopteryx infelix*, p. 858.
14. *Hyria volutaria*, p. 858.
15. *Idæa idæaria*, p. 857.
16. *Asthena querula*, p. 859.
17. —— *tristicula*, p. 859.

PLATE LVII.

Fig. 1. *Pyralis roborealis*, p. 865.
2. *Deba milvinalis*, p. 875.
3. *Iartheza obstitella*, ♀, p. 880.
4. *Charltona kala*, ♂, p. 879.
5. *Melissoblaptes depressellus*, p. 876.
6. *Metasia candidulalis*, p. 880.
7. *Eupithecia bilinea*, p. 863.
8. —— *conscensa*, p. 863.
9. *Scopula fotalis*, p. 875.
10. *Arrade massalis*, p. 866.
11. *Pyralis quisqualis*, p. 865.
12. —— *zizanialis*, p. 865.
13. *Botys epastalis*, p. 874.
14. *Idæa chotaria*, p. 858.
15. *Eupithecia testacea*, p. 863.
16. *Scoparia ictericalis*, p. 876.
17. *Pyralis xylinalis*, p. 865.
18. *Nephopteryx lentalis*, p. 877.
19. *Homœosoma derasella*, p. 877.
20. *Nephopteryx creperalis*, p. 877.

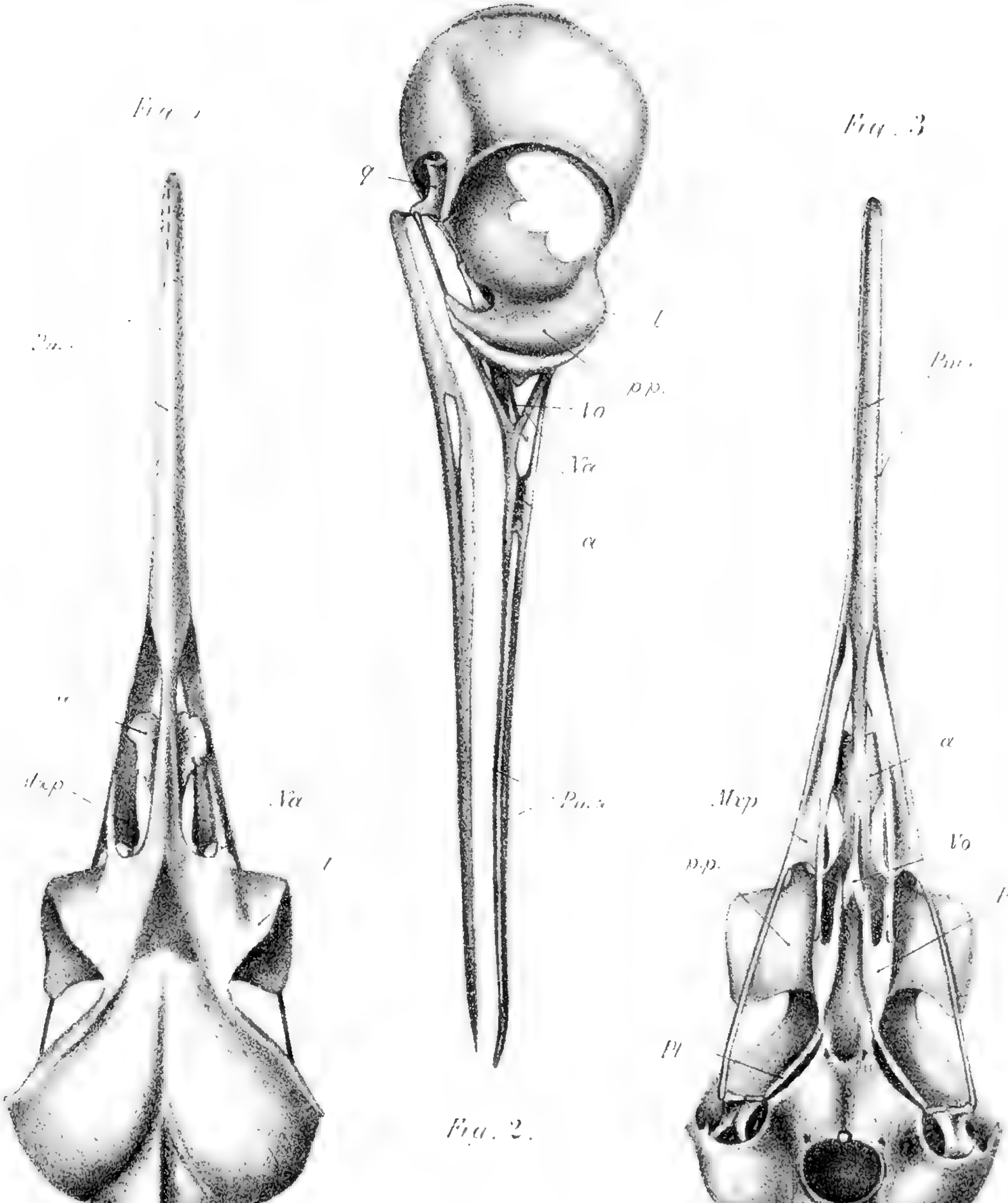
2. Contribution to the Comparative Osteology of the *Trochilidæ*, *Caprimulgidæ*, and *Cypselidæ*. By R. W. Shufeldt, M.D., Captain Med. Dept. U.S. Army., M.A.O.U., Memb. Soc. Nat. E.U.S., Memb. Philosophical, Anthropological, and Biological Societies of Washington, &c.

[Received September 16, 1885.]

(Plates LVIII.–LXI.)

As our knowledge of the structure of birds widens, it becomes more and more evident to taxonomists that ornithology nowhere presents a more unnatural order than the *Picariæ*. Of late years authors candidly confess that the families arranged under this head constitute merely a provisional grouping, though at the same time the classification as it now stands must be retained until such light as morphology brings to bear is sufficiently strong to disperse this artificial assemblage and relegate its members to their several and normal positions in the system.

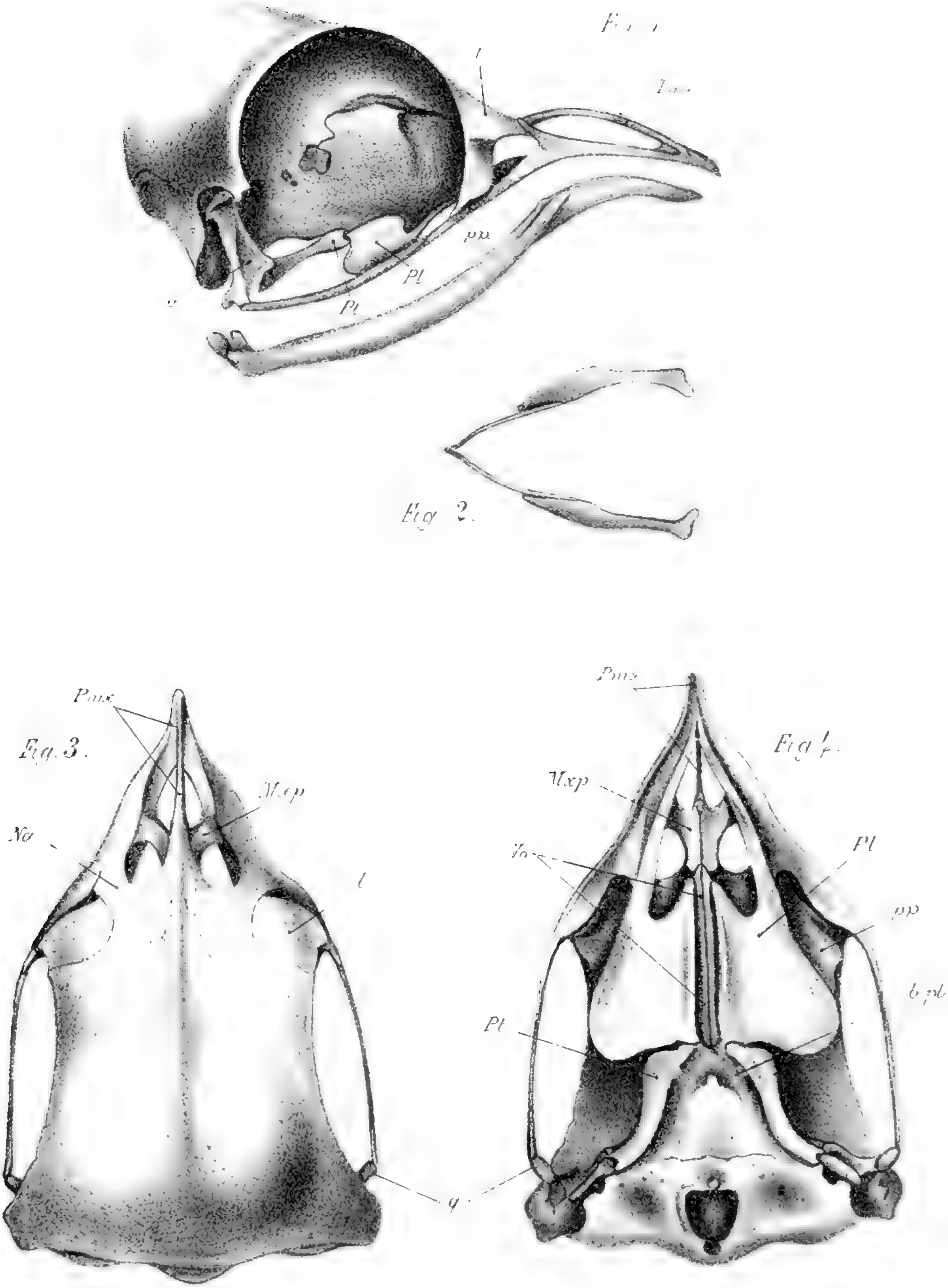
So far as our American avifauna is concerned, it has always



R.W.Shufeldt. del.

J. Smit lith.

OSTEOLOGY OF TROCHILIDÆ.



R.W. Shufeldt del.

J. Smit lith. Hanhart imp.

OSTEOLOGY OF TROCHILIDÆ.

Fig. 1

Fig. 2

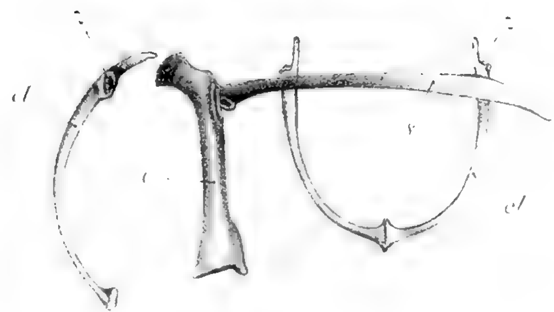


Fig. 3

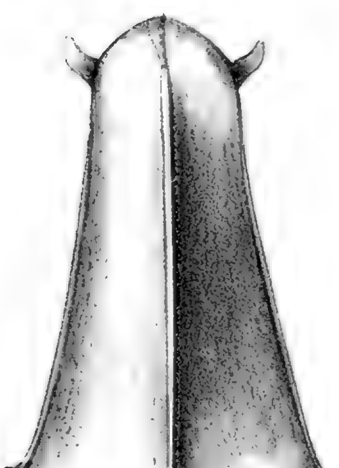


Fig. 4

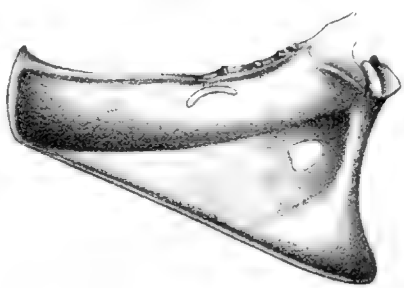
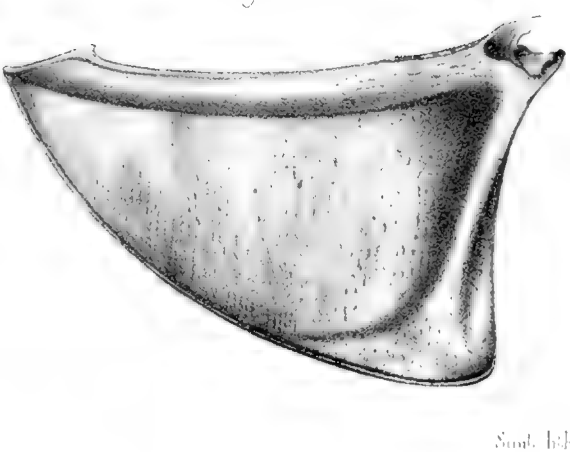


Fig. 5

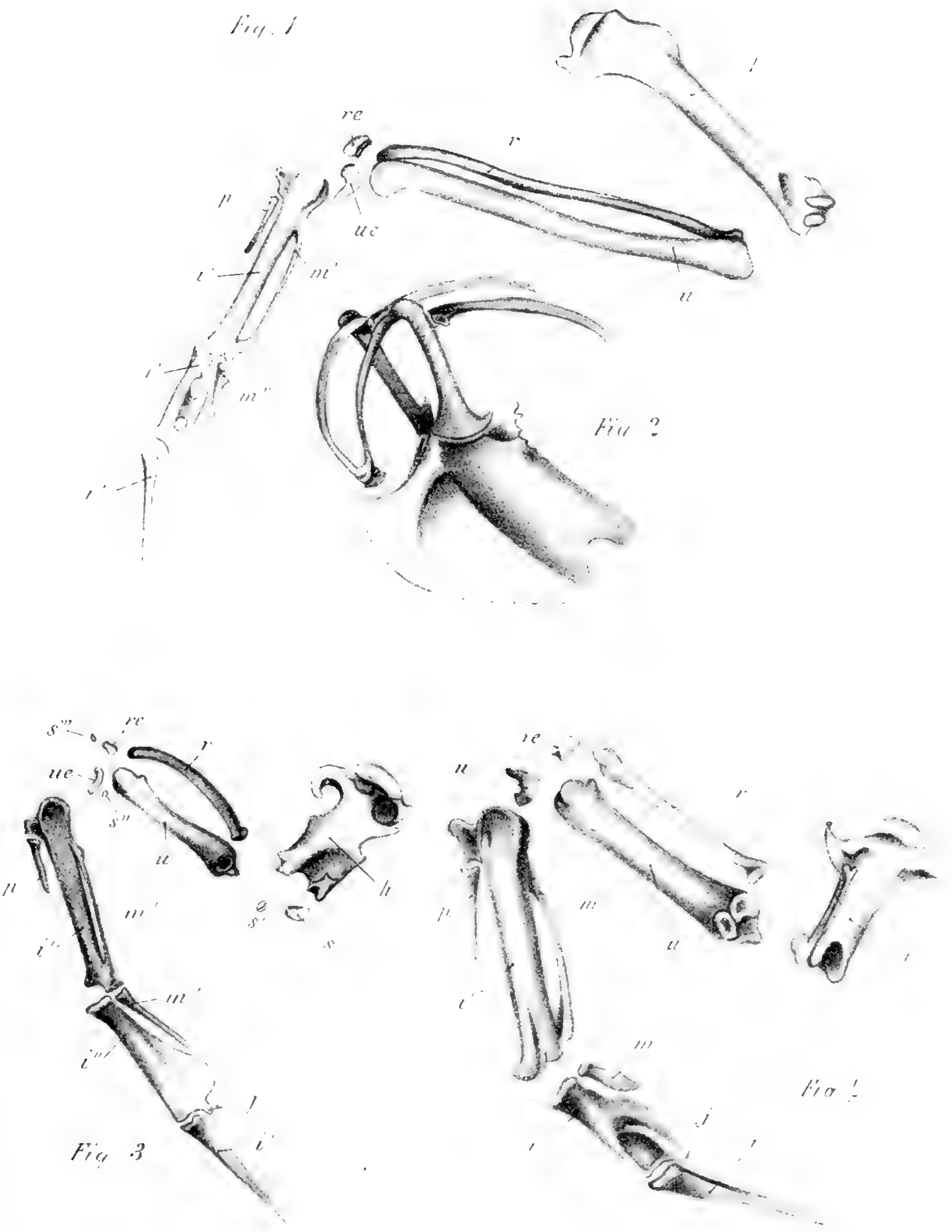
Fig. 6.



R.W. Shufeldt del.

Smit lith.

OSTEOLOGY OF TROCHILIDÆ



R.W. Shufeldt del. J Smit lith. Hanhart imp.

OSTEOLOGY OF TROCHILIDÆ

seemed to me, as it no doubt has to others, that the grouping together of the Humming-birds, Goatsuckers, and Swifts, is an evident confession of weakness on our part, besides being on the face of it a very decided violence done to natural taxonomy and the science of ornithology. As I look over the material before me, the discussion of which will make up the body of the present paper, the fact is strongly impressed upon my mind that the result of the study will prove to be more of a contribution to the *differences* to be found among the skeletons of the *Macrochires*, than it will afford sufficient data to place any of the forms in question in their proper places in the system; though I hope it may, in the end, prove to be a step in that direction also.

I am confident that this latter will not be satisfactorily accomplished in the case of the Picarian birds until we not only have a pretty thorough knowledge and understanding of their structure in its entirety, but an equally complete comprehension of the morphology of a number of the groups that are known to approach them in one particular or another.

To review the characters presented in the Trochilidine skeleton—for many of the important ones are already known to us—*Trochilus alexandri* affords a very good type. I have at hand a perfect skeleton of this Humming-bird, collected and prepared by myself for the purpose.

Of the Skull of Trochilus (Plate LVIII. figs. 1, 2, 3).—Viewing this part of the skeleton from above, we find that the superior mandible has a length of something less than two thirds of the medio-longitudinal axis (fig. 1). It is nearly flat in its anterior moiety, being much compressed from above downwards, narrow, rounded at the apex, and of nearly equal width throughout, and slightly decurved, for this part of its extent. The posterior half of the superior mandible is broad at the base, and gradually tapers forwards to merge into the portion just described; sutured traces among the bones here have all been completely absorbed; the external narial apertures are very capacious, though an attempt on the part of the nasal processes of the premaxillary to diminish their size is evidently made. This effort is to be detected in the horizontal osseous outgrowth on either side from these parts, which if it had been more extensive and produced, as it is in some birds, would have succeeded in creating narial openings, as in the majority of the class. As it is, however, in this Humming-bird a knife-blade may be carried from the foot of the nasal on the upper side of the maxillary and dentary process of the premaxillary, in contact with them to near the tip of the latter, without coming in contact with the bone above, if the knife be properly inclined at a right angle (figs. 1, 2, 3*a*). This is well seen in some Limicoline birds, as in *Numenius longirostris*, though in them the osseous outgrowth *a* referred to, is not developed [1].

[1] See author's osteology of *N. longirostris*, &c., in the Journal of Anatomy and Physiology for Oct. 1884, plate iv. fig. 3, and his meaning will be clear. Here, however, the bones simply rest against each other, though they would allow the passage of a knife-blade from *i* to *k*.

The lacrymo-frontal region is very broad transversely in *Trochilus*, and presents a deep and well-defined triangular depression in the median line, with its apex directed to the front. Posterior to this the vault of the cranium mounds up, smooth and semiglobular. A median furrow marks this part of the skull, which divides behind, to have its branches pass on either side of the supraoccipital prominence forming its lateral boundaries. In life these creases lodge the recurved and delicate extremities of the hyoidean apparatus.

The superior orbital peripheries are somewhat tilted upwards in this skull, for their posterior moieties (fig. 1).

In the side view, as shown in fig. 2, the peculiar conformation of the superior mandible is still better seen. This aspect also affords us a good opportunity to see the position of the vomer *Vo*, and its relation to the surrounding bones.

A *nasal* is a delicate and quite straight bar of bone, which descends at an angle of about 45° to meet the usual elements below and merge into them. Above, it forms the rounded posterior margin of the narial opening, thus constituting the holorhinal type of structure as described by Mr. Garrod [1].

The antorbital plate, or the "pars plana," is an enormously enlarged mass of bone, which has indistinguishably incorporated with it the *lacrymal*.

This extraordinary development may be seen in all of the views of the skull of *Trochilus* which illustrate this paper, and its form easily studied. Anteriorly, it is convex from above downwards, being correspondingly concave in a similar direction posteriorly. Above, it rises to a greater height than the margin of the orbit, while below it rests upon the maxillary and jugal bar. Its lateral extension is nearly equal to that of the brain-case behind. Now although this gives to the anterior wall of the deeply excavated orbit a nearly unbroken surface, being pierced alone by a minute foramen for the passage of the olfactory nerve, it is more than can be said for its posterior surface, which latter is almost completely deficient in an osseous partition separating the orbital cavity from the brain-case. This deficiency is so far extended forwards as to include the hinder portion of the interorbital septum. It will be seen by referring to fig. 2 that this latter is of very limited extent, as the lower notch there shown denotes the point where the optic nerve issues from the cranium. With the exception of a minute span of bone behind, the groove that lodges the olfactory nerve on its passage through the orbit is an open one, and leads directly to the foramen in the pars plana, already described.

The *quadrate* of this Hummer is an exceedingly curiously formed bone, while its method of articulation is equally unique among birds, so far as I am aware, being extended, when *in situ*, nearly in the horizontal position between its mastoidal and quadrato-jugal articulations.

Its mandibular foot presents for examination two transverse and very narrow facets, a similar number being awarded to its mastoidal

[1] P. Z. S. 1873, pp. 33-38.

end. Quite a prominent peg-like process is developed to receive the excavated end of the corresponding pterygoid. The "orbital process" is much reduced and inconspicuous, and the entire bone is thoroughly pneumatic.

Many points of uncommon interest present themselves for our examination upon the under view of the skull of *Trochilus*. They are all clearly shown in my drawing of these parts (Plate LVIII. fig. 3). Anteriorly, we observe, underlying the lateral margins of the premaxillary, its slender and free dentary processes, each fusing behind with a similarly delicate rod of bone sent forward on the part of either maxillary (*Pmx*).

We find that this last-named element developes a broad maxillo-palatine process, which latter portion is carried far forward as a free lamella of bone with pointed apex, while the maxillary proper becomes continuous with the dentary rod of the premaxillary in the method already described.

A wide interval separates, in the median space, the *maxillo-palatines* (*Mxp*), within which the *vomer* (*Vo*) is plainly to be seen. This last bone is deeply cleft behind, where it rides the very large rostrum, while anteriorly it is produced as the finest imaginable spiculi-form prolongation [1]. The posterior vomerine limbs are above the palatines, each one extending backwards nearly to the pterygoidal articulation on either side. Adopting the admirable nomenclature for the different parts of the *palatine* bone proposed by Prof. Huxley, we find that the body of the bone, being flat and horizontal, lacks the prominent internal and external *laminæ* found in many birds, its outer margin being produced forwards as a very narrow strip of bone to underlap the maxillo-palatine of the same side, and indistinguishably fused with it, at a point about opposite the anterior apex of the vomer. The inner palatine margin, for its anterior moiety, is produced forwards as a free apophysis shutting out from our sight, upon this aspect of the skull, the corresponding vomerine limb. This latter is applied to the "*ascending process*," the inner margin of which is that part of the palatine bone which rests against the sphenoidal rostrum. The "*postero-external angle*" is, in *Trochilus*, reduced to *nil*, as already hinted; the outer margin of the palatine is, from head to anterior ending, nearly a straight line.

A considerable interval exists between the palatines in the middle space, and, indeed, these bones do not come in contact with each other anywhere throughout their extent.

Posteriorly, the palatine head articulates with the pterygoid in a little pit that occupies the summit of a well-marked elevation developed on the part of the rostrum beneath the point of meeting of these elements.

[1] Professor Huxley states, in his "Classification of Birds" (P. Z. S. April 11th, 1867), that "*Trochilus* has the true Passerine vomer, with its broad and truncated anterior, and deeply cleft posterior end. I have not yet been able to obtain a perfectly satisfactory view of the structure and arrangement of the palatine bones in the Humming-birds." I must believe from the statement made in the latter half of the quoted paragraph that the skull in Prof. Huxley's hands was an imperfect one, and that the delicate vomer I have described above was broken off, leaving only the broad base referred to by him.

A *pterygoid* is a delicate and nearly straight rod of bone, articulating with the palatine in the manner just described, and with the corresponding quadrate by means of a cup-and-ball joint, the latter element developing the convexity for the purpose.

The *rostrum* is transversely very broad behind, where it is likewise longitudinally excavated. As it is produced forwards, however, it ascends, becoming gradually narrower, convex from side to side, to finally abut against the under aspect of the cranio-facial region, where we find that its anterior margin has at last attained a sharp edge. It is unnecessary to add, that this latter portion of the rostrum is made up of the ethmoidal bone, the two imperceptibly merging into each other in the Humming-birds.

Some of the characters thus far described, as they are found to exist at the under side of the skull of *Trochilus*, are curiously suggestive of the struthious type of structure, more especially the exposed and broad rostrum behind, and the method of finishing off of the maxillaries and maxillo-palatines in front. *T. alexandri* has the basi-temporal region of its skull very deep, and wide from side to side. It is pierced at about the usual sites by foramina for nerves and vessels to find their exit from, and others to enter the cranial casket. The plane of the foramen magnum is nearly coincident with that of the basis cranii; and this aperture is very large comparatively, and of a broad elliptical outline. On the other hand, the condyle is notably minute in its dimensions, and of a hemispheroidal form.

The *mandible* of the Alexander Humming-bird is seen upon lateral view in Plate LVIII. fig. 2. It will be observed that it is quite as delicately fashioned as the remaining half of the beak above. Its hinder fourth is bent downwards, and a well-marked ramal vacuity exists. Viewed upon its superior aspect, this bone has a very acute V-shaped outline, with rather a long symphysis, which latter is excavated in the longitudinal direction above. Either articular end presents a very shallow facet on its upper side; behind, its angle is truncated, while the in-turned processes of the ramal limbs at this extremity are well developed and point directly towards each other, being perpendicular to the median plane. This bone is largely pneumatic.

The elements of the *hyobranchial apparatus* are absolutely filamentous in character, the greatly lengthened thyro-hyals curving well up behind the occiput, after the style of some Woodpeckers. The first basi-branchial is very long and straight, while the second one is reduced to a mere rudiment; both are independent bones and the heads of the ceratobranchials articulated at the sides, where they meet each other.

The ceratohyals and glossohyal do not ossify in this Humming-bird.

Having examined the skeleton of *Trochilus* thus far, I will now briefly present the characters of the same part as they are found in the two remaining groups, taking up the Goatsuckers first. After that, it is my intention to discuss the balance of the axial skeleton for each type, and conclude the descriptive part of the paper with a comparison of the bones of the limbs. Finally, analytical tables will be presented contrasting the essential osteological characters of the several forms that have been examined.

Of the Skull in certain Caprimulgine Birds (Plate LIX. figs. 1–4).—It is hardly necessary for me to say that the skull of any Nightjar is as different from that part of the skeleton in *Trochilus* as this structure can well be in any two existing types of birds. Indeed, so great are the differences, and extended to so many of the parts, that I do not feel called upon to institute a comparison between the two—as this can better be done by the reader for himself from the figures in the Plates—but simply present here a description of the more important of these characters, comparing them, so far as my material will permit, with forms more or less nearly related, as well as with the corresponding characters as they occur in several species of the group.

To this end my material affords a full series of skeletons of the several representatives of the genus *Chordediles* and some excellent skeletons of *Phalænoptilus nuttalli.*

Regarding the skull of *C. texensis* from a lateral view (fig. 1), we are struck with the peculiarly arched culmen formed by the median portion of the premaxillary, which is simply a delicate, laterally compressed rod connecting the mid point of the basal region with the apex of the beak. Such a condition is approached also by many Swifts; and in Nuttall's Whippoorwill the valley which is found on either side of this arch harbours the peculiar tubular nostril of that bird.

The superior mandible, as a whole, is somewhat decurved, with cultrate margins.

A *lacrymal* is a large and freely articulated bone; above, its upper surface contributes no little amount to the general frontal area.

In this latter region its inner margin is convex and closely applied throughout its extent to the opposed concave edge of the combined frontal and nasal elements. Mesially and on the anterior wall of the orbit, the lacrymal rests upon the *upper* border of the pars plana, while on its outer aspect it presents a longitudinal and shallow groove. Its lower part is foot-like in form, directed backwards, and is in contact with the maxillary bar.

The form and method of articulation of the lacrymal in *P. nuttalli* is essentially the same as in the last species; but its descending limb has its foot portion T-shaped, and the anterior or heel-process is lodged in the broader part of the maxillary bone.

The orbital cavity in the *Caprimulgidæ* is particularly notable for the completeness of its bony walls. It is large among the Whippoorwills, but very strikingly so in the Night-hawks.

So far as I have examined the interorbital septum, it is very thick from side to side, though composed of a delicate diploic tissue, which is continuous in structure with that found about the brain-case and in the ethmoidal region, it all being overlain by a firm compact film.

A perfectly circular and small foramen rotundum opens separately into each orbit, and the other nerves have independent orifices.

In *C. texensis* the hinder part of the palatine with the broad pterygoid form quite a complete orbital floor (figs. 1 and 4), the Whippoorwills not being quite so fortunate in this particular.

The *pars plana* is always large and generally of a quadrilateral form, its outer margin being concave outwards. It constitutes a very efficient wall between the orbital and nasal cavities.

The track of the olfactory nerve is an open groove for its entire length, this branch passing directly over the free margin of the pars plana, close to the ethmoid, in the recess between the nasal and frontal bones.

I find the postero-superior periphery of the margin of the orbit to be sharp and raised in the Texas Nightjar, which is not the case in the Whippoorwills, where it is somewhat rounded and never tilted above the general frontal superficies.

Throughout the group we always see a slender and fragile quadrato-jugal bar. In *Chordediles* it curves gently upwards to meet the maxillary portion, the articulation between the jugal and maxillary in these birds being a very feeble one, and always coming away early during maceration. This latter does not apply to the Whippoorwills, in which forms we find the quadrato-jugal portion of the bar nearly horizontal, while the maxillary descends to meet the anterior end, the two uniting firmly at a rounded angle at this point, with the convexity directed outwards (fig. A, p. 893).

C. texensis possesses a peculiarly formed *os quadratum*, it being very much compressed in the antero-posterior direction, slightly twisted upon itself, and a completely aborted orbital process. The mastoidal head develops two facets, which are barely separated from each other; the outer is long, is placed transversely, and is reduced almost to knife-edge proportions; the inner is triangular, being directed upwards, backwards, and inwards.

The mandibular facets are also two in number. They have an oblique position on the foot of the bone, with the hinder end of the inner one outermost, a deep, oblique valley separating the two.

Viewing the skull of *Chordediles* from above (Plate LIX. fig. 3), we have another good opportunity to see the peculiar form of the premaxilla (*Pmx*). We also note that this Goatsucker has the holorhinal type of structure, the nasal being quite broad. In *Phalænoptilus*, however, these latter bones are different, being slender rods of bone, and considerably longer than they are in the Texas Nightjar.

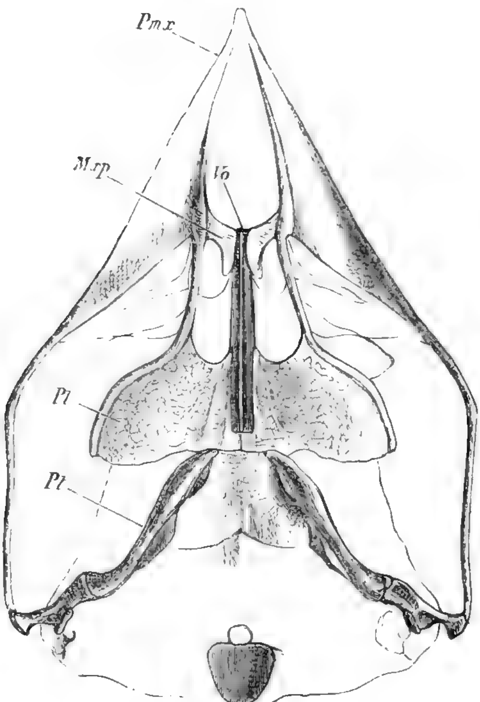
Throughout the group, we are enabled to see, upon this aspect of the skull, the upper and anterior surface of the maxillo-palatines (*Pmx*) through the open space between the maxillary and premaxillary.

In *Chordediles* the frontal region of the skull is somewhat depressed, while the cranial vault is quite dome-like in contour. Here, again, a marked difference is presented by the Whippoorwills, where the convexity is general, not nearly so decided, and in them too a strong, median, longitudinal groove traverses this part of the skull.

Whippoorwills have a far more compressed skull, in the vertical direction, than the Night-hawks; and there is a great deal about this part of the skeleton in them that reminds one of the skull of some of the Owls.

Turning to the under side of the skull of *Chordediles* (as shown in Plate LIX. fig. 4) we find the well-developed *maxillo-palatines* (*Mxp*) in contact with each other for their entire lengths in the median line. In very old Night-hawks this close union finally results in anchylosis, thus producing a perfect direct desmognathous condition of type of palatal structure in these birds. The broad

Fig. A.



Under view of the Skull of *Caprimulgus europæus* (×2) (after Huxley).
Pmx, premaxillary; *Mxp*, maxillo-palatine; *Vo*, vomer; *Pl*, palatine; *Pt*, pterygoid.

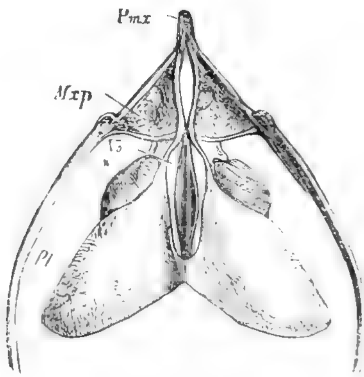
and long *vomer* (*Vo*), with its median carination beneath, merges with the palatines posteriorly, while in front its free tip just rests in a notch found at the middle point of the apposed maxillo-palatines behind.

Nuttall's Whippoorwill exhibits a very different condition of these parts from this; in it we find the maxillo-palatines are well separated from each other in the median line, and fail to come in contact with the vomer above them. This latter bone is even broader than in the Texan Nightjar, being *rounded* in front, but otherwise agreeing very well with that bird.

In fact in all essential details, so far as the osseous structures at the base of the skull are concerned *Phalænoptilus* agrees with the same parts as shown by Professor Huxley in his figure of *Caprimulgus europæus*, in his memoir upon the Classification of Birds (P. Z. S. 1867), and I have reproduced that figure here in order to show their arrangement (fig. A, p. 893).

To recall also this eminent biologist's observations upon the skull of the European Goatsucker, the following passages are quoted from the memoir in question; he says, "The skull of *Caprimulgus*, though

Fig. B.



View of the palate without the pterygoid bones of *Nyctibius jamaicensis*. Seen from below (after Huxley). Letters as in former figures.

it retains the general features of the Passerine cranium, departs from the typical Passerine structure still further than the Swifts, the body of the palatines having become exceedingly broad and flattened out, while the vomer is longer and narrower than in the Swifts or the typical Passerine birds. The expanded inner end of the slender and characteristically Passerine maxillo-palatines are quite distinct from the vomer and from one another.

"*Caprimulgus* further presents a remarkable contrast to the Swifts and all the true Passeres in having well-developed basipterygoid processes. These are absent in *Ægotheles novæ-hollandiæ*, the palate of which is intermediate between that of the Goatsuckers and that of the Swifts.

Nyctibius closely resembles *Caprimulgus*, even to possessing the very peculiar division of each ramus of the mandible into two portions—the one of which is movable upon the other—pointed out in the latter genus by Nitzsch. But the slender anterior processes of the palatines are closely approximated in the middle line, instead of remaining widely separated, as in *Caprimulgus* and *Trochilus*; and the maxillo-palatines are closely adherent to them and to the vomer, though a true anchylosis does not appear to have taken place" (fig. B).

Thus we see that the American genus *Chordediles* approaches *Nyctibius* in this particular.

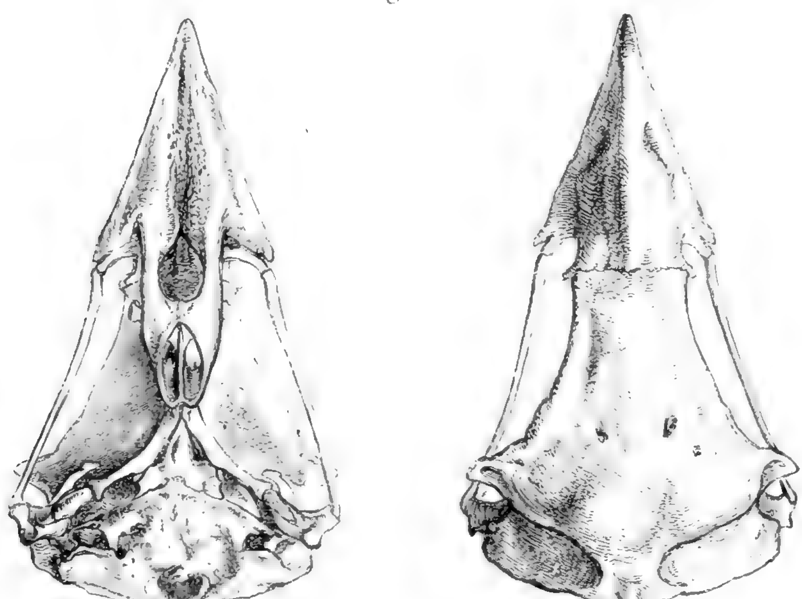
Returning to the basal view, again, of the former bird (fig. 4, Plate LIX.), we find that the palatines are very broad, flat, and smooth, lying mostly in the horizontal plane. Their postero-external angles are rounded, while their ascending processes are just sufficiently pronounced to afford a low crest behind to unite with the vomer. Anteriorly, their narrow and ribbon-like extremities can be traced to the apex of the superior mandible (fig. 4).

The *pterygoids* are much flattened from above downwards, while their anterior ends are somewhat dilated. Beneath this latter portion we find each articulating with the basisphenoidal facet. Quite an interval separates the points where they articulate with the palatines, and the joints are very close ones, the palatines themselves being anchylosed together at their heads.

The case is different in Nuttall's Whippoorwill, where an appreciable interval separates the palatine heads, and these really articulate with the rostrum, the vomer being found immediately beyond this minute point of separation of the palatines. In this bird, too, these last-named bones are not nearly so much spread out as they are in the Night-hawks, and their postero-external angles are quite pointed.

In speaking of the skull of *Steatornis*, the lamented Garrod says,

a Fig. C. *b*



Skull of *Steatornis*.

a, base; *b*, superior surface.

"In the skulls the lacrymal bones are not developed as they are in the Strigidæ and Caprimulgidæ. The palate is strongly desmognathous, as in the Falconidæ, and much more so than in the Strigidæ, which are almost schizognathous. The palatine bones also meet across the middle line for $\frac{1}{8}$ of an inch, in a manner which is quite peculiar, and can be best understood by a reference to the drawing, each bone being apparently folded on itself behind the point of junction with its fellow, and articulating with the basisphenoidal rostrum, as well as anchylosing with the vomer by its inflected and upward-turned margin; each developes a very short slender anteriorly directed process close to the vomer, which projects forwards on each side of it near its middle.

"The vomer itself is a quarter of an inch long, slender and quite blended with the palatines; its anterior pointed extremity advances as far forwards as the posterior border of the median palatine symphysis mentioned above.

"The posterior external angles of the palatines, so large in *Caprimulgus* and *Podargus*, are not developed. The basipterygoid facets are large. In the eye the sclerotic ossifications are not considerable, as in the Owls, being not at all unusually developed [1].

Among the American Nightjars the basitemporal area of the skull is both broad and deep. A lip of bone usually shields the double entrance to the Eustachian tubes, while the lower margins of the auricular rims are produced well downwards.

The condyle is small and of a hemispherical form; the plane in which the periphery of the foramen magnum lies makes an angle with the plane of the basis cranii of about forty-five degrees. A rounded notch is found in the medio-superior margin of the foramen in *Chordediles*, which is not seen in the Whippoorwill. The supraoccipital prominence is barely pronounced; it may be pierced by a foramen in the middle line in some specimens of the Texas Night-hawks.

Huxley and Nitzsch have both called attention to the peculiar conformation of the mandible in the *Caprimulgidæ*. This structure is well to be seen in all of our American forms of the group, and is shown in the drawing (Plate LIX. figs. 1, 2). The ligamentous union between the dentary and paddle-shaped ramal portions is very slight, and during the ordinary process of maceration of the skeleton of a Nightjar this is one of the first points to give way—the jaw coming apart in three pieces.

The limbs of the *hyoidean apparatus* flare out in a fashion to correspond with the general form of a Goatsucker's mouth.

In *Chordediles* the basibranchials are in one piece, they being in two in Nuttall's Nightjar. Both birds have the extremely slender

[1] A. H. Garrod, "On some points in the Anatomy of *Steatornis*" (P. Z. S. 1873, pp. 526–33), speaking of the sclerotal plates of the eye, says, "I find that they are quite small in the *Caprimulgidæ*, although the circle they form is comparatively a large one. In the Humming-birds they are about in proportion with the size of the birds. Some of the Swifts, however, present rather an unusual condition of these plates, the posterior ones being much the deepest, which depth gradually diminishes, as we pass either way round to the opposite side of the circlet, the middle anterior one being the narrowest plate of any; this feature is quite noticeable in some of the Swallows."

hypohyals quite long, their cartilaginous ends curling well up behind the skull. Minute cerato-hyals may ossify in *Chordediles*; but I have not observed them to do so in *P. nuttalli.*

This anterior portion of the apparatus has the arrow-head form seen among the class generally where that part is short, and the glossohyal is not produced far forwards.

Of the Cypseline Skull.—Upon a lateral view of the skull of *Panyptila saxatilis* the external narial aperture is seen to be very large and elliptical in outline. The maxillary process of the nasal descends in a straight line to join the maxillary below, which latter bone, like the premaxillary, is very delicately constructed. I have failed to find a free lachrymal in the Swifts, and if it does occur it is very rudimentary. It is just possible that it may be incorporated with the pars plana, as it is in the Swallows and some other passerine birds.

Owing to the narrowness of the mid-frontal region, the orbital cavity, though very capacious, is not relatively so deep as in *Chordediles,* but has the same general aspect it presents in the Swallows. The interorbital septum usually contains one or two extensive vacuities in it, and the greater part of the tract for the olfactory nerve and its cranial exit is deficient in bony support.

The pars plana is of a quadrate outline, very large and, I believe, in all true Cypseline birds, of a tuberous conformation, as it here is in the Rock-Swift.

Panyptila has a quadrate-bone in many respects like *Chordediles*; the orbital process, however, is very much better developed, though not quite so well as it is in the Swallows, where it wears more the character of the Passeres. The two facets upon the mandibular foot of the bone are almost exactly as we find them in the Night-hawks, while the antero-posterior compression of the body is equally well marked. Two narrow facets are found upon the summit of its mastoidal head.

The quadrato-jugal rod is slender and retains a uniform calibre to the maxillo-jugal junction, when it becomes laterally compressed before arriving at the expanded portion.

Seen from above, the general contour of the skull of the Rock-Swift closely resembles that of a Swallow; in the former, however, we find the median portion of the premaxilla constructed upon the same plan as I described it for the Goatsuckers, being reduced to a thread-like rod of bone between the insertion of the nasals behind, and where it merges into the mandibular tip in front.

This gradually expands after it passes the former point to make rather a broad insertion as it abuts against the cranio-facial region, leaving, as it does so, a conspicuous triangular vacuity on either hand, between it and the nasals.

The cranio-facial region is somewhat concaved, while the interorbital space, upon this aspect of the skull, is narrow, in both of which particulars the Swifts agree with the *Hirundinidæ.*

The vault of the cranium is smooth and uniformly convex, being barely marked in the median line by a longitudinal crease. All of the essential characters of the basal aspect of the skull as found in the typical Swifts are present in *Panyptila*, and they perfectly agree in most important points with the same characters as described by Professor Huxley for *Cypselus apus* (figs. D and E).

The *vomer* (*Vo*) is long and narrow, being deeply cleft behind where it straddles the rostrum of the sphenoid. Either limit is carried back as far as the palatine head of the corresponding side, with which it firmly articulates, as well as with the initial portion of its ascending process. Anteriorly, the vomer dilates into a horizontal, triangular extremity, the line of the base being in front, its angles just resting, one on either side, on the upper edges of the broad maxillo-palatines, while the apex merges into the cleft portion which extends backwards.

A *maxillo-palatine* (*Mxp*) has the form of a spherical triangle, is notably well developed, but does not meet its fellow in the median line, the interval being spanned by the vomer, as just described.

The *palatines* (*Pl*) are principally in two horizontal planes, and either one has a very characteristic form in the Swifts, which is nearly approached by the Swallows. Its inner margin is deeply cleft, giving rise to an anteriorly directed process that is quite striking in the *Cypselidæ*, though it amounts to nothing more than an exaggeration of a similar condition found in the Passeres.

The narrow palatine body merges anteriorly into the premaxillary, and as it passes forwards to do so, underlaps the great tuberous antorbital; while further on, it shuts out of sight from this view the connection between the vomer and the maxillo-palatine.

Another exaggeration of a Passerine character of the palatine, seen in the Swifts, is the form assumed by the postero-external angle of the bone. It is in them produced into a well-marked oblong process directed backwards and outwards (see figs. D, E, and F).

In the Passerine birds generally the palatines have but one point where they come in contact, and this is at their heads under the rostrum, where they articulate with the pterygoids. This applies also to the Swallows, while in *Panyptila*, and presumably in other Swifts, these bones fail to meet even here, being separated by quite an appreciable interval (fig. D). We have already seen that they are very widely separated in *Trochilus* at this point.

A *pterygoid* (fig. D, *pt*) is a very long, slender, and straight rod of bone, having the same essential characters and making the same style of articulations with quadrate and palatine, as in the typical Passerine birds.

In most particulars of any importance, so far as the basis cranii, the rostrum, ethmoid, and all other parts of the skull of *Panyptila* are concerned, they make no great departures from the generalized Passerine skull, and they are by no means very different from such characters as they are found in *Hirundo*. Indeed, so far as this part of the skeleton goes, my studies of the osteology of American *Cypselidæ* and *Hirundinidæ* fully confirm Professor Huxley's investigations in that direction, who long ago pointed out the close relationship of these two groups of birds (P.Z.S. 1867, p. 452).

Fig. D.

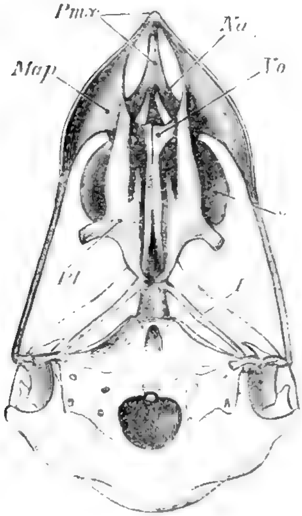


Fig. E.

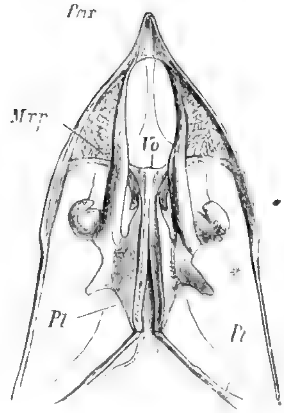


Fig. F.

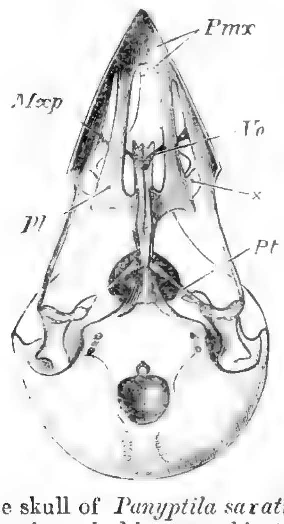


Fig. D. Under view of the skull of *Panyptila saxatilis* (×2). (Drawn by the author from a specimen in his own cabinet.)

Fig. E. Under view of the anterior portion of the skull of *Cypselus apus* (×2). (after Huxley).

Fig. F. Under view of the skull of *Tachycincta thalassina* (×2). (Drawn by the author.)

Pmx, premaxillary ; *Mxp*, maxillo-palatine ; *Vo*, vomer ; *Na*, nasal ; *Pl*, palatine ; *Pt*, pterygoid. In figure E the anterior excavated end of the vomer has a crescentic shape, its angles terminating in free horns above the palatine bones by which they are concealed in the figure. The * directs attention to the inferior portions of the antorbitals. They have a very peculiar form in *C. apus*, as shown in fig. E.

In *Tachycincta thalassina*, as a representative of the Swallows (fig. F), we find the broad *vomer* (*Vo*) doubly notched in front, whereas in a skull of *Oroscoptes montanus*, as a typical Passerine, there is but one such notch; otherwise in its relations, as well as the hair-like maxillo-palatines with their backward-turned bulbous ends touching each other in the median line, these several elements are essentially similar.

Moreover, we can easily see the evident middle place the *palatines* of this violet-green Swallow hold, both as to their form and arrangement, between the Swifts and more typical Passeres.

Such a serial resemblance in gradation is again beautifully exemplified in the *mandibles* of these birds. In *Panyptila* both the angular processes and the ramal cavities are missing; they are both fairly well developed in the Swallow, while in most true Passeres they are a decided feature.

Of course there is but little or no resemblance between the mandible of a Swift and of a Humming-bird.

What I have said about the *mandibles* of these several forms applies with equal truth to the *hyoidean apparatuses*; in all, the first and second basibranchials are in one piece, and the elements of the glosso-hyal portion remain in cartilage throughout life.

Of the remainder of the Axial Skeleton in Trochilus.—One cannot well study the spinal column of Alexander's Humming-bird without the aid of a strong lens; the writer was obliged to bring to his assistance a microscope armed with a 2-inch objective. By the help of this instrument I count 13 vertebræ in the cervical region before we come to that one which bears the leading pair of free ribs. In the middle of the series these develop very long postzygapophyses, and the finest imaginable parial parapophyses.

The neural spines are nearly entirely suppressed throughout the series, while the fifth, sixth, seventh, eighth, and ninth contribute to form the carotid canal. After these a strong median hypapophysis is found on each segment.

The articulation of the centra are heterocœlous. Freely suspended ribs are found upon the 14th and 15th vertebræ, the last pair having epipleural appendages.

The 16th vertebra has a fully developed pair of ribs, which are the first to connect with the sternum by costal ribs. This vertebra is characterized by a low neural spine and single long median hypapophysis.

The 17th vertebra also possesses perfect ribs, and in it the hypapophysis is not so prominent, and the neural crest is still inconspicuous.

Strange to say, the 18th and 19th vertebræ, with complete ribs reaching the sternum by hæmapophyses, are thoroughly anchylosed with the pelvic sacrum, having their neural spines and hypapophyses merged into each other as common superior and inferior crista respectively. The former soon subsides upon the dorsal aspect of the sacrum, while the latter is met by a transverse crest developed by the 21st vertebra, beyond which it subsides over the body of the 23rd vertebra. This arrangement forms a crucial raised crest on this aspect of the pelvis, which strikes one upon the first glance at the bone. Two more ribs follow the pair borne by the 19th vertebra; the first of these meet the last pair of costal ribs below, while above, their tubercula and capitula have been so far absorbed that these ribs look as if they were anchylosed to the outer margin of the ilium on either side. The last pair of ribs neither meet the sternum below nor the pelvis above, but are attached to the pair just described. These ribs differ from the preceding ones in not developing epipleural appendages. This arrangement, it will be seen, gives 8 pairs of ribs; the first two pairs do not reach the sternum; the next 5 pairs do, meeting 5 pairs of costal ribs; finally the last pair are in every sense floating ribs.

Through the 27th vertebra, the following segments are appropriated by the sacrum; then come 5 free caudals, making 32 vertebræ in the spinal column of this Humming-bird, the whole being finished off by a comparatively large pygostyle, probably composed of several others.

The *pygostyle* is terminated in a peg-like point, and is not flattened and quadrilateral as in the Swifts and many Passeres.

Trochilus has a short and broad pelvis, being much compressed from above downwards. Viewed from above, we find that the open "ileo-neural grooves" are over the 18th and 19th vertebræ, the two described above as anchylosing with the fore part of the sacrum. This arrangement is rare among existing birds—unique so far as I can recall at the present writing. The anterior and in-turned extremities of the ilia are rounded points, meeting the outer sacral margins just opposite the posterior endings of the ilio-neural grooves. The parial foramina among the diapophyses of the urosacral vertebræ are quite large.

Professor Owen found them small in a specimen of *Trochilus pella*[1].

Upon a lateral view we observe that the narrow ilium is much concaved immediately anterior to the cotyloid cavity; its outer margin forming a part of the long gentle curve completed by the postpubis, which latter projects far behind where it is turned upwards. No propubis is developed.

The acetabulum, ischiac, and obturator foramina present nothing of marked interest; they have all an average size and are in due proportion with the surrounding parts.

The obturator foramen is thoroughly closed in by the ischium, after which this bone arches over an obturator space, to meet the postpubis again in a little foot-like process.

In many birds a notch on the hinder border of the pelvis denotes the landmark between ilium and ischium in this situation. No such feature exists in *Trochilus*, this Humming-bird having in the posterior portion of its pelvis much to remind us of similar parts of the skeleton in the Passeres.

The *sternum* (figs. 3 and 6, Plate LX.).—So far as its general form and characteristics go, the sternum in the Hummers has long been known to us, and this information has been principally derived from

[1] 'Anat. and Phys. of Vert.' vol. ii. p. 32. Lond. 1866.

studies of the structure of the present genus. In *T. alexandri* we find that the bone has a round anterior margin with complete abortion of the manubrial process. Just within this line, the sternum is much thickened, mounting up above in the median line into quite a prominent pyramidal elevation. On either side of this a circumscribed pit is found, while mesially, and directly behind it, is a single pneumatic foramen. For the rest, the dorsal aspect of the bone is smooth and generally concaved.

The costal processes are conspicuous, being directed forwards and outwards, and either costal border behind them supports five articulations for the costal ribs.

Plate LX. fig. 6 shows the wonderful depth of the sternal keel in this unrivalled little prince of volants. In front it is fortified by a thickened rib of bone, as in most carinate birds, while its convex inferior margin is finished off with a rim, which appreciably projects beyond it all along its sides.

The posterior sternal margin is entire, being convex outwards and approximately a portion of an arc of a circle with a radius of 6 millimetres (2·4 mms. in the fig., it being $\times 4$).

Much stress has been laid upon this fact in comparing the *Trochilidæ* with the Swifts; but a comparison of the figures will at once show how essentially different these bones are.

Turning now to the *shoulder-girdle* of *Trochilus alexandri*, we are confronted with an exceedingly interesting structure and one which markedly departs from these elements in ordinary birds. Of the three bones the most striking difference is seen in the *coracoid* (Plate LX. fig. 5). This element has a straight shaft with a very slightly dilated sternal end, the whole being much compressed in the antero-posterior direction. Just above its middle it is pierced by an elliptical foramen with its long axis corresponding with the long axis of the shaft; immediately above this, again, we find a similar foramen that represents the *tendinal canal* in other birds, but here completely surrounded by bone. The glenoid cavity is comparatively large and projecting, while the summit of the bone, when the arch is *in situ*, points towards the median plane.

Professor Owen's figure of *T. pella* referred to above shows very well indeed the position of the *furcula*, when articulated as in life, in the Hummers. Its seemingly high position is largely due, however, to the great depth of the carina in these birds.

As for the bone itself, we find it assuming a form at the very limit of the U-shaped variety.

Its limbs are almost filamentous in character, and the hypocleidium of rudimentary development only.

Its heads are compressed from side to side, but very slightly enlarged, and are quite sharply crooked downwards and backwards to have their apices meet the scapulæ. They rest against the coracoids on the mesial side of the bridge that closes in the tendinal canal alluded to above.

A *scapula* contributes but a very small share of the articular surface to the glenoid cavity—less than a fourth, I should judge.

The bone is notably compressed in the vertical direction from head to apex, the former being unusually flattened for a representative of this class.

Rather more than the hinder third of the blade is bent abruptly in such a manner as to have the angle occur on the inner margin, with its aperture, quite an open one, to the outer side. From this point to the sharp apex, the blade gradually tapers away.

When this pectoral arch is articulated the axis of the shaft of the coracoid is approximately in a plane which is parallel to the plane of the dorsal surface of the sternal body.

Of the remainder of the Axial Skeleton in certain Caprimulgine Birds.—Nuttall's Whippoorwill and *Chordediles* each have eleven vertebræ in their cervical region before we come to a segment supporting a free pair of ribs. Each agrees, again, in having this first pair of ribs rather long and without epipleural appendages. In the Whippoorwill the next pair of ribs also have free extremities and well-developed processes anchylosed to them, while in the Nightjar, these latter also being present, we find that the ends of the ribs articulate with sternal ribs. These are of unusual type in a specimen before me, being high up on the costal processes, exceedingly small, indeed far smaller than I ever saw them in a bird of the same size, and the one on the left side being anchylosed to the sternum. Posterior to this pair of ribs both of these forms agree again, and that in having four more pairs each.

Of these, the first three fulfil all the requirements of true dorsal ribs as we find them among birds generally. The last pair spring from the sacrum, although their hæmapophyses also reach the costal borders of the sternum. They do not have epipleural appendages upon them.

It will be seen that this arrangement gives the Goatsuckers 16 movable vertebræ in the column before arriving at the first one appropriated by the pelvis.

Then, as well as I can manage to count in the adult specimens, either of these birds has ten more segments in the pelvic sacrum. *Chordediles* differs from the Whippoorwills, however, in having six caudal vertebræ and a pygostyle, whereas the latter have but five and the terminal piece. In either genus the *pygostyle* has a long, sharp, and straight superior border, and a thickened posterior one, especially below where a triangular flattened area makes its appearance, and the bone is not nearly so deep in the antero-posterior direction.

With the exception of the tuberous apophysis of the axis, the vertebræ in these birds are notable for the entire absence of the neural spines until we find them developed in the dorsal series. On the other hand, after passing the four or five vertebræ in the mid-cervical region that are marked by the open carotid canal, the hypapophyses are quite a prominent feature, and it is only in the last two segments before the pelvis that these latter are absent.

The lateral canals commence in the third vertebræ and extend through the cervical series as usual.

The transverse processes of the tail-vertebræ in *Chordediles* are very long, and though the neural spines are not lofty, the last four segments have prominent bifid hypapophyses, which are not nearly so conspicuous in the Whippoorwill.

Notwithstanding the fact that the *pelvis* has the same general characters alike in these two genera, there are at the same time a number of striking minor differences which render it impossible to mistake their identity.

In both forms the bone is notably spread out and flattened in the vertical direction; this is perhaps best marked in the Nightjars, where, too, we find the ilio-neural grooves shallow and wide, and the anterior or preacetabular portion of the ilium long and narrow, being concaved for its entire length. The parial foramina on the hinder moiety of the dorsal aspect are large, regularly decreasing in size as we pass forwards. Upon this view the tops of the anti-trochanters form a prominent lateral feature of the pelvis.

Regarding the bone upon side view in *C. texensis*, we observe that the outer marginal line of the ilium is directly continuous with the postpubis behind, the propubis being entirely absent.

The postpubic element is extremely slender, and in direct contact with the inferior margin of the ischium for its entire length, projecting but a short distance beyond it behind.

The obturator foramen is relatively very small, and, indeed, neither the acetabulum nor the ischiac foramen is of great size comparatively.

P. nuttalli has a proportionately deeper and narrower pelvis than the one just described for a Night-hawk, with its ridges and lines more pronounced, giving the bone a more angular aspect.

The ilia in front have their anterior ends drawn out into points, and turned in nearly to touch the quite prominent crista formed by the common neural spines of the sacral vertebræ. This feature is characteristic of the pelvis in the Whippoorwill, and at once distinguishes it from the pelvis in the other genus.

Plate LXI. fig. 2 shows very well the general form of the *sternum* and the *shoulder-girdle* in the *Caprimulgidæ*, and their mutual relation when articulated *in situ*, the specimen being from *C. texensis*.

It will be seen that the sternum is broadly 1-notched at its posterior border; that it is without a manubrium, and has a concave anterior, and convex inferior border to its handsome keel, the angle at the meeting of the two being rounded off.

The costal processes are well pronounced (still more so in *P. nuttalli*), and the sternal body is decidedly concave on its dorsal aspect, usually showing a median pneumatic foramen in front.

A *coracoid* has a subcylindrical shaft of considerable length, terminated above in a tuberous summit, and a well-dilated sternal extremity with upturned external process. These bones, when articulated, do not meet in the median line. The *furcula* assumes the U-shaped pattern of the bone, with but a fairly-well developed hypocleidium. Its limbs are transversely compressed, and the terminal head not much dilated. These latter rest, when *in situ*, against the coracoids, their apices extending backwards to touch either scapula. In Nuttall's Whippoorwill an outer ledge is developed on either clavicular head to abut against the corresponding coracoid in front, a feature which is still better displayed on the part of the *Cypselidæ* (Plate LX. fig. 2, *z*).

A *scapula* in the Night-hawk has the typical blade-like portion, which is more inclined to be truncated in *Phalænoptilus.* Both birds have its head broad transversely, and somewhat flattened from above downwards. When articulated it rests upon rather a meagre scapular process of the coracoid, with its inner angle extended forwards to meet the clavicle, as already defined above.

The elements of the pectoral arch seem to be non-pneumatic bones throughout the *Caprimulgidæ.*

Of the remainder of the Cypseline Axial Skeleton.—We find in the cervical region of the column of *Panyptila saxatilis* twelve vertebræ before meeting that one in which the pleurapophyses have become liberated as ribs. These latter are here of the most rudimentary character; for in a specimen before me, on one side the rib is merely represented by a minute rod of bone suspended from beneath the transverse process, while on the opposite side the head of the bone is found, and the whole is rather more advanced. The atlas is more than usually delicately constructed, while the axis is very narrow in the antero-posterior direction.

A shallow carotid canal seems to be confined to the fourth and fifth vertebræ, the usual process taking its place after that. All these vertebræ, as a rule, are notably short, with well-developed pre- and post-zygapophyses.

Beneath, the parapophyses are as long as the centra, and are placed rather close together on each vertebra.

The articulations are of the heterocœlous type, and the lateral canals are very short. One very interesting feature is seen in this part of the spinal column of the White-throated Rock-Swift, and that is the ossification of the interspinous ligaments among the ultimate segments. The neural spines of the tenth, eleventh, twelfth, and thirteenth vertebræ are low and inconspicuous, and the fine thread-like ligament that joins these processes has become thoroughly ossified, the minute osseous rods thus formed articulating, at either end, with the neural spines of the vertebræ in question. These vertebræ, in *Panyptila*, are essentially very different from the corresponding bones in *Trochilus.*

The fourteenth vertebra possesses a pair of free ribs, which may or may not have uniform appendages near their lower extremities; and this segment has likewise many of the characteristics of the dorsal series that follow.

Below it develops a tricornuate hypapophysis, this process being markedly prominent on all the succeeding vertebræ, occurring also upon the first two in the sacrum, an unusual thing. The presence of this formidable series of hypapophyses is accounted for by the same law that demands their presence in *Colymbus,* the sole difference being that, while the latter, by the aid of his strong wings, passes with the greatest velocity beneath the water, the Swift in its flight paddles the air with an equal rapidity of wing, both birds requiring powerful *longi colli* (and consequent firm and extensive supports for them), these muscles being the ones brought into action in seizing their prey during the height of this volant motion.

The fifteenth, sixteenth, seventeenth, eighteenth, and nineteenth vertebræ are true dorsals, having perfect ribs connecting them with the sternum; and they have low neural spines which interlock with each other at their ends, these vertebræ all being freely movable upon one another.

Nothing of special importance characterizes these ribs; all have strong epipleural appendages anchylosed to them, save the last pair, in which they are absent. Two pairs of feeble ribs also spring from beneath the sacrum, the hinder pair being very rudimentary in some specimens.

From the twentieth to the twenty-ninth vertebræ, all inclusive, are firmly anchylosed together to form the pelvic sacrum. To their outer common diapophysial margins, the ilia make thorough connection, the sutural traces being nearly absorbed. A few small foramina are found upon the dorsal aspect among the fairly defined transverse processes.

Six vertebræ and a large pygostyle make up the skeleton of the tail. The last but one of these has wide-spreading diapophyses, the others being less prominent in this particular.

Adding all these together, we find that the spinal column of *Panyptila* contains, besides its pygostyle, thirty-five vertebræ, three more than we found in the spinal column of *Trochilus*, which contains but thirty-two.

The violet-green Swallow has thirty-five vertebræ in its column, and presumably others of the family have the same. Moreover, the essential characteristics as seen in the ribs, pelvis, and other parts of the axial skeleton also agree.

In the short and wide *pelvis* of *Panyptila* we find upon superior view open ilio-neural grooves, a small preacetabular area, with the concave surface of the bone, on either side, facing upwards, forwards, and outwards. The postacetabular portions of the ilia are each of a quadrilateral outline, and their superficies uniformly convex.

A side view of the pelvis presents a large, elliptical, ischiac foramen, a small cotyloid ring, and considerable traces of an obturator space, the foot-like process of the ischium meeting the postpubis behind the last.

This pattern of the bone is pretty much the same as we find it in the Swallows (*Hirundo, Tachycincta, Petrochelidon, Cotile*), the principal differences being, that in the latter group the parial foramina among the sacral transverse processes are always notably large, and the posterior ilio-ischiac margins are notched (barely perceptible in *P. saxatilis*); both of these characters, especially the last, are well-known Passerine ones.

The form assumed by the *sternum* in *Panyptila* is shown in figures 1 and 4 of Plate LX. Here, upon the ventral aspect we see the prominent, triangular, costal processes, with their borders behind them, each of the latter supporting five articular facets. From the last of these the sternal body becomes progressively wider to terminate in acute postero-external angles formed by the intersection of the unnotched, slightly convex, xiphoidal border.

So thin are the walls of the body of this sternum that we frequently find large vacuities existing in it that tend to be symmetrical in character for either side of the carina.

This attenuity of the sternal body does not apply, however, to its margins, the two lateral, as well as the hinder one, being characterized by a thickened deposit of bone.

Upon a lateral view we are enabled to see that the sternum of this Swift develops quite a prominent manubrium, which stands between the coracoidal facets. These latter are of an oblong form, with their long axes parallel to the plane of the keel. The keel is thickened in front, and concave forwards.

Its angle is rounded off, and the line of its lower margin nearly straight; it may, too, show deficiencies in its substance similar to those in the body.

This keel to the sternum of the Swift is not so deep in comparison with the remainder of the bone as we often find it among the Passeres, and in this particular it is not to be mentioned with the extraordinary carinal development in *Trochilus* (Plate LX. fig. 6).

A glance at Plate LX. fig. 2, is sufficient to convince us that *Panyptila* has a *shoulder-girdle* differing in many important respects from the Humming-birds, as well as the typified arch of the Passeres. Its *furcula* is broadly U-shaped, with scarcely any hypocleidium developed below. The apices of the heads reach back to the scapulæ, and they also possess the outer lateral abutments (fig. 2 *z*) for the heads of the coracoids, much as we found them in Nuttall's Whippoorwill.

As for *coracoid* and *scapula,* the former has a prominent head directed forwards and upwards, a shaft shorter than in the Swallows; but otherwise both this bone and the latter differ in no leading details from the same elements as found in these birds. And at the same time it is hardly necessary to add, after what has gone before, that it, as a whole, differs fundamentally and in essential details from the girdle in *Trochilus.*

Swallows, as we know, have both sternum and pectoral arch agreeing with the Passerine type. This family also has the *os humero-scapulare* developed, a fact which intimates that the affinity between these two groups is still the closer.

Of the Pectoral and Pelvic Limbs in the Humming-birds, Nightjars, and Swifts (Plate LXI. figs. 1, 3, and 4).—So far as I have examined them, the Caprimulgine birds have their pectoral limbs constituted as in the ordinary representatives of the class. The *humerus,* in proportionate length with the bones of the antibrachium (fig. 1), has quite a straight subcylindrical shaft, a rounded and rather short radial crest, a pneumatic fossa and foramen, arched over in the usual manner by the ulnar crest, and finally a distal extremity presenting all the characters of this part common to the avian brachium. As will be seen from the figure, the *ulna* and *radius* present nothing peculiar. The free bones in the carpus are two in number, as is the rule for birds. The *metacarpus* offers us nothing worthy of special note, as may be seen from the drawing. The pollex-phalanx is composed of but one joint, the index-digit of two; and the usual small one in the next finger. The expanded portion of the proximal phalanx of the index shows two perforations; these run into one large one in Nuttall's Whippoorwill—a rare condition.

This last-named bird has the skeleton of its arm, with the exception of this one detail, agreeing in all essential respects with the bones just described. Pneumaticity does not extend beyond the humerus in true *Caprimulgidæ*.

Turning our attention to the Humming-birds, we find that the *humerus* in *Trochilus* is a most extraordinary structure, departing, as it does, both in form and proportions, from that bone as it occurs in most birds. The humeral head for the glenoid cavity has much the same contour as elsewhere in the class; but the radial crest is represented by a strong and gracefully curved hook curling over in the direction of the shaft. Another prominent process points forwards and outwards, which has its base just beyond the distal portion of the periphery of the pneumatic foramen. Eccentricities of form are none the less evident in the shaft of this unique bone. This is of a quadrilateral outline, broadly oblong, and somewhat curiously twisted.

The trochleæ of the distal end are very prominent, while opposite them on the anconal aspect, is found, holding a mid position, a deep and rounded excavation. In life this harbours a large sesamoid; and another, about one third its size, is at the elbow (Plate LXI. figs. 3 s, s').

The *radius* and *ulna* are but little longer than the humerus; the former is much bowed, giving rise to a large "interosseous space" when these bones are duly articulated. The ulna is nearly straight, having a stout, subcylindrical shaft; and notwithstanding the presence of the sesamoid in the olecranon fossa of the humerus, the process of this name is well developed upon it.

Two small sesamoids are found about the carpal joint (s'', s'''), while its true elements, the *ulnare* and *radiale*, are manifestly different from these segments in ordinary birds, the former in being almost devoid of the characteristic apophyses, and the latter in being less angular.

This Humming-bird has a *metacarpus* notably longer than the bones of its antibrachium. Its index and midshaft are quite straight (i', m'), the latter being produced further distally, and supporting a considerable facet for its unusually long finger-joint m'' (compare with figure 4). The pollex-digit has but one joint (p), two being awarded to the index, the proximal one of the latter having its blade portion very much expanded and a mid process (j) at its lower margin—an uncommon site for it.

Comparing these points in the skeleton of the arm of *T. alexandri*, with the similar points in the corresponding limb of *Panyptila saxatilis* as shown in figure 4, we find that scarcely one of them exactly agrees with the other. Indeed, the differences are very striking and important, and far greater than commonly occur among birds generally.

To commence with, the *humerus* in the Swift, though short, is of entirely a different form. Its radial crest curves towards the humeral head; the ulnar crest is powerfully developed, though the fossa it arches over contains no pneumatic opening, the bone not enjoying this property as does the humerus in *Trochilus*. Again, the apophysis at the base of this fossa is not found in the Swift as it was in the Humming-bird, though in the former a distinctive tubercle occurs beyond the base of the radial crest, which is absent in the latter.

The olecranon fossa is even deeper and better defined than in *Trochilus*, though I have failed to find any of the sesamoids present in the limit of that little bird; and among these the large one which corresponds to the one marked *s* in figure 3. *Panyptila* has the oblique and ulnar tubercles of this distal humeral extremity also markedly protuberant.

Radius and *ulna* are here both very straight, and differ from the Humming-bird in being appreciably longer than the bone of the brachium.

Ulnare and *radiale* segments of the carpus deviate but slightly from the general contour of these bonelets in Passeres, and still less from them as found in some Swallows.

Metacarpus is comparatively large and heavy, its form being well shown in fig. 4. It will likewise be observed that the digital formula agrees with the *Trochilidæ*, as it does with Passerine types; the individual bones, however, have forms peculiar to themselves. These can be best appreciated by a study of them in the Plate, and far better than can be conveyed in any written description.

Huxley, in alluding to the relative lengths of the bones of the pectoral limb in the *Trochilidæ* and *Cypselidæ*, says that the "two families have a length of the manus and a brevity of the humerus which is peculiar to themselves, being only approached by the Swallows, and in a less degree by the *Caprimulgidæ*.

"In both *Caprimulgus* and *Ægotheles* the manus is slightly longer than the ulna, and the latter considerably exceeds the humerus in length." [1]

My studies of the skeletons of American forms of these several families fully bear out the results of the investigations of this eminent biologist upon this point.

Owing to the fact that the structure of the foot and certain parts of the *pelvic limb* can be studied from external inspection with results far more satisfactory than can be hoped for, from the very nature of things, from an equal amount of attention paid to the wing of a bird, it stands to reason that, as a rule, these parts, so far as

[1] "On the Classification of Birds," P. Z. S. 1867, p. 469.

their composition goes, are more generally known, and the characters they present have been enlisted by ornithologists from time immemorial to serve the purposes of classification.

Thanks to this being the case, references to the member in the present instance can be made much briefer than in the case with the pectoral limb, and still fully meet our purpose.

In Whippoorwills and Night-hawks the bones of this extremity are always non-pneumatic, and, with the exception of rather a short tarso-metatarsus, harmoniously proportioned as to lengths and calibre.

Chordediles possesses nearly a straight shaft to its *femur*, which is smooth, and quite cylindrical. The trochanterian ridge does not rise above the articular summit of the bone, and of the condyles at its distal extremity the external one is the lower.

A *patella* seems to be wanting in these birds, its place being filled by a bit of cartilage in the tendon.

The shaft of *tibio-tarsus* is likewise straight and subcylindrical; the chief point of interest in this bone, however, is the complete suppression of the ectocnemial ridge, while the procnemial one seems to have moved to a more central position on the shaft.

A not very strong *fibula* fails to anchylose with this latter below, and makes unusually weak connections with it above.

Tarso-metatarsus has a subcubical hypotarsus, apparently unpierced by the flexor tendons; otherwise this segment presents nothing worthy of special record. A well-developed *accessory metatarsal* is attached in the usual way, rather high on the shaft, by ligament. The formula for the podal digits, being 2, 3, 4, 4, is well known and requires no particular mention.

In the delicate pelvic limb of *Trochilus* we also find a non-pneumatic *femur* with straight and cylindrical shaft, and with the characters of the extremities much as in the Goatsuckers. Humming-birds, however, have a large, free *patella* developed, of the most usual form.

In them the fibula remains independent of the main leg-bone, but is notably short and puny.

Tibio-tarsus has nearly a straight shaft, and carries the peculiarity seen in *Chordediles* one point further, in having both the cnemial ridges so feebly pronounced as hardly to be noticed, unless specially searched for, when only faintest traces of the procnemial ridge become evident. The usual osseous bridge confines the extensor tendons at the distal end of this bone.

The hypotarsus of the *tarso-metatarsus* is both pierced and grooved for the transmission of the flexor tendons, and the free accessory metatarsal is suspended high upon its shaft.

In number and arrangement the joints of the digits of pes agree with the formula of the typical Passerine foot, and are here most noted for the unusual lengths of the ungual phalanges when compared with the basal and remaining joints.

While the pelvic limb in the Swallows seems to be constructed after the true Passerine type, in the Swifts it makes a marked departure from this, presenting at the same time a number of points of no little interest.

Returning to our White-throated Rock-Swift, I find that the proximal end of its *femur* is so broad in its transverse diameter as to obliterate the neck, making the head of this bone more than usually sessile with the shaft.

The trochanterian ridge does not rear above the plane of the summit; in fact, the top of the bone is entirely level. Its shaft is cylindrical only at its middle, from which point it gradually enlarges in the direction of the extremities.

The intercondyloid fossa is shallower than is commonly the case, and the prominences themselves not so sharply defined as they often are in other birds.

This Swift does not possess a *patella*, as we found to be the case in *Trochilus*.

So poorly developed is the *fibula* that in the specimens before me I fail to find an instance where it is produced beyond the fibular ridge on the side of the shaft of the tibio-tarsus. Above this, however, its condition is somewhat better, and it meets the femur in the usual notch of the outer condyle.

Tibio-tarsus differs very considerably from this bone as it occurs in the vast majority of the class. The outline of its proximal extremity is nearly square, and the undulating articular surface it encloses gradually slopes from the inner to the fibular side. There is no trace whatever of the pro- and ectocnemial ridges on the anterior aspect, where they occur in most birds.

The shaft is straight though slightly compressed in the antero-posterior direction. As we approach its distal end, it becomes curiously twisted, giving the condyles a peculiar cant not easy to describe. The inner condyle is fully as prominent behind as it is in front (rare), while the intercondyloid notch is of equal depth all the way round. The bony bridge for the extensor tendons is present and situated low down, while on the inner and anterior border, higher up on the shaft than common, is seen a strong tubercle for ligamentous attachment, a ligament which we know fulfils a similar purpose.

The *tarso-metatarsus* is comparatively short, and it, too, is quaintly fashioned. Its hypo-tarsus is perforated by one large and open groove, which absorbs its entire central portion, to the very base of this process, being continued down the shaft behind as a shallow excavation. Anteriorly, the shaft is longitudinally and still more decidedly grooved, being pierced above by a foramen that passes directly through the bone. The usual foramen occurs at the distal extremity for the passage of the artery.

The anterior faces of the three trochleæ are about in the same plane in front, while posteriorly they develop prominent processes for the attachment of strong ligaments, which confine the plantar tendons as they pass to the toes.

Of these three trochlear projections the innermost one is the lowest, the middle one rather higher, and the outermost one the highest of all.

This Swift forms no exception to the well-known rule which applies to the Cypseline foot, the joints of the podal phalanges being arranged upon the plan of 2, 3, 3, 3, for the first, second, third, and fourth toes respectively.

Analytical Synopsis of Skeletal Characters of certain PICARIÆ.

Of TROCHILUS ALEXANDRI :—1. Osseous mandibles tenuous, more than twice as long as remainder of skull. Antorbital very large, and indistinguishably blended with lacrymal. Great deficiency of bone in interorbital septum and anterior wall of brain-case. Dentary process of premaxillary and the maxillary form a free rod beneath the lateral margin of premaxillary, on either side, fast only at its extremities.

Maxillo-palatines flat, horizontal lamina, widely separated in the median line. *Vomer* deeply cleft behind, with long, free, spiculaform anterior extremity. *Palatines* are widely separated in the median line, most so behind. Outer margins for their entire length nearly a straight line. Long and slender anteriorly, where each one merges into the corresponding maxillary to be produced far forwards in a pointed lamelliform *free* extremity. *Rostrum* very broad. *Pterygoids* straight and subcylindrical rods. *Quadrate* with peculiarities of form and articulation. Angle of the *mandible* truncated.

Hinder elements of the *hyoidean apparatus* curl up behind the skull in life.

2. Spinal column contains 32 vertebræ and a pygostyle; last two dorsals anchylosed to pelvic sacrum. *Sternum* long, gradually widening as we approach xiphioidal extremity, which latter has an entire and rounded border. Manubrium absent. Carina of great depth. In the *shoulder-girdle*, the coracoid is peculiar in having the tendinal canal closed with bone, and a large perforation in the shaft below it. Sternal extremity not dilated. Hypocleidium of very broad U-shaped furculum rudimentary. Blade of scapula bent at an obtuse angle outwards in the same plane that its principal surface is in.

3. *Humerus* short and broad, of very peculiar form, but slightly shorter than ulna. Radius much arched. Metacarpus considerably longer than ulna; the phalanges of manus wonderfully long and peculiarly developed. Four *sesamoids* in this limb, two in the carpus, and two at the elbow.

Large free *patella* in pelvic limb. Pro- and ectocnemial processes of *tibio-tarsus* are rudimentary. Hypotarsus of *metatarsus* both pierced and grooved for tendons. Hallux incumbent; joints of pes normal (2, 3, 4, 5).

Of the Genus CHORDEDILES :—1. Osseous mandibles broad and short. Lacrymals large and free. Walls of orbit entire, with exception to the regular foraminal openings. *Maxillo-palatines* are in front of the vomer, in contact for their entire lengths in the median line, where they may anchylose. (Two exceptions to this known to me, namely, the genera *Caprimulgus* (Huxley) and *Phalænoptilus*.)

Vomer has its rather pointed anterior end resting between maxillo-palatines in this genus; broadly rounded and free in *Phalænoptilus*; truncated in *Caprimulgus* (Huxley). *Palatines* broad, and with rounded postero-external angles, anchylosed together at their heads (separated in *P. nuttalli*). Basipterygoid processes present. Mandible has the ramal portions in slender pieces from the slender dentary part. Basibranchials of hyoidean apparatus co-ossify in this genus, but are in two pieces in *P. nuttalli.*

2. *Sternum* broadly 1-notched; carina deep; no manubrium.

3. Bones of pectoral limb harmoniously proportioned, and present no special peculiarities. The radius and ulna are considerably longer than humerus. *Patella* absent in pelvic limb. Hypotarsus of metatarsus impierced for tendons. Formula for podal digits 2, 3, 4, 4.

Of PANYPTILA SAXATILIS:—Characters of, 1, the skull essentially agreeing with those given by Huxley for *Cypselus apus*, and presented in detail above.

2. The *spinal column* contains 35 vertebræ and a pygostyle. Xiphioidal border of *sternum* entire and rounded; carina moderately deep only. A manubrium of no small size is developed. Coracoids and scapulæ in the *shoulder-girdle* something like the Swallows, but furculum has the abutments on the outer sides of the clavicular heads for the coracoids.

3. Shaft of *humerus* short, radial crest curled towards the humeral head. Non-pneumatic. *Ulna* and *radius* both straight, the former considerably longer than the humerus. (Sesamoids absent in the arm?) *Carpo-metacarpus* large and longer than the antibrachium. Digits normal and differing in form entirely from *Trochilus.*

Skeleton of pelvic limb characteristic. Lower end of *tibio-tarsus* peculiarly twisted. Pro- and ectocnemial ridges not developed (negative character). No *patella. Fibula* does not extend below the articular ridge of the other leg-bone (this is also the case in some Parrots, *Conurus*). Hypotarsus of *tarso-metatarsus* containing one deep groove. Formula for digits of pes, 2, 3, 3, 3, as in all the Cypselidæ.

CONCLUSIONS.

Huxley's investigations of this group in 1867, led him to believe that "the Caprimulgidæ come near *Trogon*, and more remotely approach *Podargus* and the Owls." Six years afterwards Garrod threw not a little light upon this question by his careful dissections of *Steatornis*, although this talented anatomist still left that bird's position in the system a matter of doubt.

My own studies of the skeletons of these forms, including *Surnia funerea* and many other Owls, strongly incline me to the opinion that one group should be made to contain all the typical Caprimulgine forms, as well as *Nyctibius*, *Steatornis*, and, no doubt, others, as *Podargus* and *Psalurus*, the skeletons of which I have not yet examined.

Such a group, or an order, might be well termed the CAPRIMULGI;

and, as we know, it is pretty well represented in nearly all parts of the world. Structurally, on the one hand, their relationship to the Owls is very close, through *Podargus* and *Steatornis*. Opportunity has not been afforded me to pick up the other end of the thread, but I am very confident that their affinity with the Swifts is anything but a near one.

With the exception of a few minor points in their organization, the Swifts are essentially modified Swallows, and, as the family Cypselidæ, they belong, in the order Passeres, next to that group. The fact, that in common with Humming-birds, so far as we know the structure of these latter, they have a short humerus and an entire, unnotched xiphoidal extremity to the sternum, is no more reason that the two groups should be classed together, than *Talpa* and *Ornithorhynchus* should be for like resemblances. Such similarities are due to physiological adaptation of structure, referable in the present instance to the pecular flight of these birds, and the consequent requirements of the muscles involved in it. Moreover, our investigations above have shown really how very different these parts are when they come to be carefully compared. So far as the skeleton goes, and it is usually supported by associated parts, the entire summation of the truly fundamental characters of the genus *Trochilus* are at great variance with the corresponding ones in the skeleton of *Cypselus*, and militate against the propriety of retaining such forms closely associated together in the same group.

The anatomy of the Humming-birds is not as yet sufficiently well known for us to exactly define their position in the system; but if we may be permitted to judge from the skeleton of *Trochilus*, there is no reasonable doubt that the extraordinary characters it presents fully entitle these birds to a group by themselves, as an order TROCHILI. Morphologically (and morphology is really the only guide, when properly interpreted, that we possess, to natural taxonomy) such a group, I think it will be found, can be fully as well characterized as the Psittaci are, and rested upon fully as firm a foundation, and equally as well circumscribed. It would contain upwards of 500 species, which is very considerably larger than the order containing the Parrots.

At the present time I am not prepared to say much about the affinities of this group, as I should first like to examine a number of Old-World forms before advancing an opinion.

No little significance, however, attaches to the facts brought to light through the dissections of the *Trogonidæ* by the late and lamented Forbes (P. Z. S. 1881, p. 836), showing the construction of the palate in these birds. It will be seen from the figure this author presents of *Pharomacrus mocinno* in the work referred to, that the *maxillo-palatines* in this Trogon are well separated in the median line, that the *vomer* is long, free, and slender, and that the *palatines* nowhere come in contact with each other, and are far apart behind. All this agrees with *Trochilus*, and I only regret that I have not at hand a few skeletons of different Trogons to further compare these birds with the Humming-birds.

EXPLANATION OF THE PLATES.

[All the figures in the Plates were drawn by the author from the specimens.]

Plate LVIII.

Fig. 1. Skull of *Trochilus alexandri*, superior aspect, with mandible removed, × 4. *Pmx*, premaxillary; *a*, an ossification from the same; *mxp*, maxillo-palatine; *Na*, nasal; *l*, lacrymal.

2. Right lateral view of *Trochilus alexandri*, × 4, same specimen; *q*, quadrate; *Vo*, vomer; *pp*, pars plana; and other letters as in fig. 1.

3. Under view of the skull of *Trochilus alexandri*, × 4, same specimen, mandible removed. *Pt*, pterygoid; *Pl*, palatine; and other letters as before.

Plate LIX.

Fig. 1. Right lateral view of the skull of *Chordediles acutipennis texensis*, × 2; letters as in Plate LVIII.

2. Inferior view of mandible of the same specimen as in fig. 1. Life-size.

3. Superior aspect of the skull of *Chordediles acutipennis texensis*, × 2; same specimen as before; mandible removed. Letters have the same meaning.

4. Inferior view of the skull of *Chordediles acutipennis texensis*, × 2; same specimen as in fig. 1; mandible removed; *b.pt*, basisphenoid. Other letters as before.

Plate LX.

Fig. 1. Pectoral aspect of sternum of *Panyptila saxatilis*, × 2.

2. Shoulder-girdle of *Panyptila saxatilis*, same specimen, × 2; *cl*, clavicle; *z*, the ledge it develops on the outer side of its head for the coracoid; *c*, coracoid; *s*, scapula; *z'* and *cl'*, same as *z* and *cl*, but the bone they refer to is a front view of the *furcula*, shown in side view at *cl*.

3. Pectoral aspect of sternum of *Trochilus alexandri*, × 4.

4. Right lateral view of the sternum of *Panyptila saxatilis*, × 2, same specimen as shown in fig. 1.

5. Anterior aspect of right coracoid of *Trochilus alexandri*, × 4; same specimen as in Plate I. Compare this bone with the Swift's coracoid shown in fig. 2.

6. Right lateral view of sternum of *Trochilus alexandri*, × 4; same specimen as in Plate I. Compare this sternum with the very differently formed one from a Swift in fig. 4.

Plate LXI.

Fig. 1. Left pectoral limb of *Chordediles acutipennis texensis*, life size, palmar aspect; same specimen as shown in Plate II. *h*, humerus; *u*, ulna; *r*, radius; *re*, radiale; *ue*, ulnare; *p*, pollex; *i'*, index metacarpal; *i''* and *i'''*, its phalanges; *m'*, middle metacarpal; *m''*, its digital joint.

2. Shoulder-girdle and sternum, from the same specimen as in fig. 1, left three-quartering view; life-size. The several bones *in situ*.

3. Left pectoral limb of *Trochilus alexandri*, × 4; from the same specimen as in Plate LVIII. Letters have the same significance as those in fig. 1, with *s*, *s'*, *s''*, and *s'''*, sesamoids; *I*, process of index phalanx.

4. Left pectoral limb of *Panyptila saxatilis*, × 2; from the same specimen used in former figures; both these limbs are, with the exception of radius and ulna, seen upon anconal aspect, the excepted bones being rotated nearly to the radial view. Letters have the same significance as those in figs. 1 & 3.

3. Preliminary Notice of the Isopoda collected during the Voyage of H.M.S. 'Challenger.'—Part II.[1] *Munnopsidæ.* By Frank E. Beddard, M.A., F.R.S.E., F.Z.S., Prosector to the Society[2].

[Received November 19, 1885.]

The family of the Munnopsidæ, originally founded by Prof. M. Sars on a single species, *Munnopsis typica*, is now known to include a large number of species, which have been referred by Prof. G. O. Sars to four distinct genera, viz.: *Munnopsis*, *Desmosoma*, *Ilyarachna*, and *Eurycope*; the majority of these Isopoda have been dredged off the coast of Norway by G. O. Sars; *Munnopsis typica* and *Eurycope gigantea* have been described as occurring in the Arctic region, and two species *Munnopsis typica* and *Eurycope robusta* have been recorded by Harger from the E. coast of N. America. Beyond a few scattered observations in papers communicated to the Royal Society of London (Proc. Roy. Soc. 1874) by the late Dr. v. Willemoes Suhm, nothing is known of the forms which inhabit the southern hemisphere. The specimens dredged by the 'Challenger' nearly all come from the antarctic area; they are referable to fourteen distinct species, including one new genus. I have named them as follows:—

1. *Eurycope sarsii.*
2. *Eurycope novæ-zealandiæ.*
3. *Eurycope atlantica.*
4. *Eurycope fragilis.*
5. *Eurycope pellucida.*
6. *Eurycope abyssicola.*
7. *Eurycope spinosa.*
8. *Eurycope intermedia.*
9. *Ilyarachna*, sp.
10. *Munnopsis latifrons.*
11. *Munnopsis australis.*
12. *Munnopsis gracilis.*
13. *Acanthocope spinicauda.*
14. *Acanthocope acutispina.*

All these species are, with the exception of *Ilyarachna*, inhabitants of deep water.

Munnopsis, Sars.

Three out of the fourteen Munnopsids obtained by the 'Challenger' appear to me to be referable to the genus *Munnopsis*; in one instance (*M. gracilis*) there can be, I should imagine, but little doubt of the correctness of this identification. Both the remaining species diverge somewhat in structure from *Munnopsis typica*; the differences are, however, perhaps not greater than those which separate different species of other genera (e. g. *Desmosoma*), and I prefer, therefore, for the present at least, to retain both species within the genus *Munnopsis* without pledging myself definitely.

1. Munnopsis gracilis, n. sp.

A single specimen of this species was dredged off the North Island of New Zealand in 1100 fathoms of water.

The single specimen is a male and measures 12 millim. in length.

[1] See P. Z. S. 1884, p. 330.

[2] Published by permission of the Lords Commissioners of the Treasury.

As in *M. typica* the anterior part of the body, consisting of the head and of the first four segments of the thorax, is wider than the posterior region of the thorax and the abdomen ; the first segment of the thorax is the smallest, the second is the largest and projects considerably dorsally above the general surface of the body ; the two next segments are a trifle smaller and subequal. The fifth segment is triangular in shape, very narrow anteriorly, and wider posteriorly ; it is longer than either of the succeeding segments, which are very short ; the seventh is almost fused with the abdominal segment ; the latter is long, with a narrow median raised area ; it terminates in two minute posterior tubercles, outside of which are the uropoda. The surface of the body is smooth and devoid of spines.

The mandibles have no palp.

Station 168, 1100 fathoms.

2. Munnopsis latifrons, n. sp.

A single example, female, measuring 15 millim. in length, from N. Pacific, off Japan.

The head is long in proportion to the other segments ; it is as long as the first three taken together ; the first four segments of the thorax appear on a dorsal view to be subequal ; the lateral regions, however, increase progressively in length from before backwards ; the segments are excavated above. The three posterior segments of the body do not differ widely in transverse diameter from the anterior segments as they do in *M. typica* ; their shape is more like that of *Eurycope* ; the first of these segments is decidedly the shortest in the dorsal region, laterally they are all subequal in antero-posterior diameter. The abdomen is rather damaged, it appears to be oval in form, and rounded off at its free extremity ; laterally, and in front of the articulation of the long styliform uropoda is a spiny process directed backwards; the antennæ are of great length, measuring 87 millim. ; the flagellum is very much shorter than the last joint of the peduncle, measuring only 5 millim. The mandible has a palp.

The first pair of thoracic appendages form a very distinct prehensile band ; the last three pairs of appendages are natatory and like those of *M. typica*.

Station 232, 345 fathoms.

3. Munnopsis australis, n. sp.

The third and last species which I refer to this genus is represented by a single individual, dredged between Prince Edward's Island and the Crozets. It measures 8 millim. in length.

The body has the typical form of the genus. The first segment of the thorax is very short, the second five or six times as long, and subequal with the two next. The width of the body is greatest at the second segment. The remaining segments of the thorax (5–7) are extremely narrow ; the first of those segments is very much the longest, perhaps three times as long as either of the following.

The abdomen is long and narrow, about as long as the last three segments of the thorax; it terminates in a short conical process.

The antennæ are very long, measuring about 36 millim.; the flagellum is about as long as the peduncle, and is not distinctly jointed.

The mandibles are conical in form, with only a single tooth-like process; they have no palp.

The uropoda are short and uniramose, biarticulate.

Station 147, 1600 fathoms.

Eurycope, Sars.

Of the eight species described in the following pages, four have been assigned to the genus *Eurycope*, chiefly as a matter of convenience. *E. novæ-zealandiæ*, *E. fragilis*, *E. atlantica*, and *E. intermedia* are, I am convinced, rightly assigned to this genus; of the other species, *E. sarsii* and *E. spinosa* are probably rightly placed, while with regard to *E. pellucida* and *E. abyssicola* I do not feel capable of pronouncing a decided opinion; they may be the representatives of a new genus altogether, but the specimens are so imperfect that I do not feel justified at the present moment in removing them from *Eurycope*, especially since there are no strong reasons to be deduced from the organization of the species, which are decidedly against such a view of their affinities.

1. Eurycope novæ-zealandiæ, n. sp.

Of this species a large number of individuals were dredged off the N. island of New Zealand. The largest examples measure up to 12 millim. in length.

The head is smooth and narrower than the first segment of the thorax; the four first thoracic segments are excavated dorsally and increase gradually in lateral diameter up to the fourth, which is the widest; the antero-posterior diameter of the first segment is considerably longer than the three succeeding segments, which are subequal. In the median dorsal line of segments 2–4 (inclusive) is an upright spiny process directed somewhat forwards. The lateral margins of segments 3 and 4 are prolonged into a forwardly directed spine; two similar spines are found upon the epimera of these and of the preceding segments. The three posterior segments of the thorax are directed backwards; they are closely adpressed and convex dorsally; on either side of the median dorsal line of each segment is a pair of blunt tubercles which in other species (*E. fragilis* and *E. atlantica*) are prolonged into spines; the lateral margins of these segments are directed forwards as spiny processes. The abdominal segment is roughly triangular in form, terminating in an obtusely pointed extremity; just in front of the articulation of the uropoda is a short lateral process on either side; the antero-lateral margins are prolonged into short, flattened, spiny processes corresponding with those upon the thoracic segments.

The antennæ are rather more than twice the length of the body.

The uropoda are biramose and very minute; the inner branch shorter and more slender than the outer branch.

Station 168, 1100 fathoms.

2. Eurycope sarsii, n. sp.

This is one of the largest species of the genus, and was dredged at two stations between Prince Edward's Island and the Crozets.

The length of the largest individual is 24 millim.

The head is about equal in size to any of the anterior segments of the thorax. The first four segments of the thorax are of about the same antero-posterior diameter, the fourth being, if anything, rather narrower than the rest; the lateral diameters of these segments progressively increase, so that the fourth is the widest. The upper surface of these segments, as of the body generally, is utterly devoid of spines or tubercles which are often found in this genus; the first four thoracic segments are concave dorsally, the rest convex; the lateral margins of the terga, as well as of the epimera in the anterior segments of the body, are prolonged into a short forwardly directed spine. Of the posterior thoracic segments the lateral margins are prolonged into a flattened spine; this is also the case with the antero-lateral margins of the abdominal segment. The abdominal segment is bent down at its extremity; as in *E. novæ-zealandiæ* and other species the surface is divided into two lateral and a median convex area by shallow furrows; there are no lateral processes as in other species, nor is the extremity prolonged but is abruptly truncated.

The antennæ and thoracic appendages were all lost.

The mandibles are furnished with a three-jointed palp, the last joint set transversely and somewhat clawed; the mandible terminates in a number of stiff tooth-like processes, below there is a tuft of slender hairs; the molar process is long and beset with fine hairs.

The uropoda are minute and biramose.

Station 146, 1375 fathoms; Station 147, 1600 fathoms.

3. Eurycope intermedia, n. sp.

This small species is represented by a single individual, 9 millim. in length. The anterior margin of the head is prolonged into a short rostrum, which is bifid at its tip. The first four segments of the thorax are subequal in length, they are excavated above; in the dorsal median line of all these segments is a short spine; the lateral margins of these segments with the possible exception of the fourth, are not prolonged into spines; but the epimera are so prolonged. The three posterior segments of the thorax have each a pair of short spines, one on either side of the dorsal median line. The shape of the abdominal segment readily serves to distinguish this species from any of its allies; as in *E. fragilis* the abdominal segment is notched on either side and front; beyond the notch is a short transverse process which overlies the uropoda; the terminal extremity is smooth and rounded off, and not prolonged into a spine.

Station 252, 2740 fathoms.

4. Eurycope atlantica, n. sp.

This species is represented by a single specimen dredged in the North Atlantic.

The specimen measured 10 millim.

The species is very closely allied to *Eurycope fragilis*. The head is long, equalling the two first segments at the thorax taken together; it has a pair of hooked spines, one on either side of the median line. Of the first four segments of the thorax, the first is rather shorter than the rest, which are subequal; the three last of these segments are furnished with a longish median spine; the lateral margins of these segments, as in so many other species, are prolonged into a forwardly directed spine.

The three posterior segments of the thorax have the form characteristic of the genus; the two first of these segments have a pair of median dorsal spines, which appear to be wanting on the third.

The abdominal segment is somewhat oval in form, and terminates behind in an obtusely pointed extremity; in front of the articulation of the uropoda are a pair of lateral spines which are curved forwards in a crescent shape; in front of these, and near to the antero-lateral margin, are another pair of spines. On the dorsal surface are also a pair of spines, situated one behind the other.

Station 76, 900 fathoms.

Eurycope, sp.

At Station 147 a fragment of an Isopod was obtained, which I refer doubtfully to the above species; it consists of the last three segments of the thorax and the first half of the abdomen; all these thoracic segments have a pair of median spines, and there are two dorsal spines upon the abdomen; the size of the fragment indicates a specimen of about 20–25 millim. in length.

Station 147, 1600 fathoms.

5. Eurycope fragilis, n. sp.

This species has a greater horizontal and vertical distribution than any of those obtained by the 'Challenger.' A large specimen, measuring 30 millim., was dredged in the Antarctic Ocean south of Kerguelen; another specimen, smaller, between Prince Edward's Island and the Crozets; and a third between Kerguelen and Australia; finally, a number of small individuals were dredged off the coast of Japan in the North Pacific.

This species is nearly allied to *E. atlantica*, but differs from it in the following points:—there are no spines developed upon the head, which is smooth and convex as in the majority of species. The abdomen differs very much in shape in the two species; in the present species it is wide and more triangular in form; the anterior lateral spines are nearer to its articulation with the last segment of the thorax; there is only one spine upon the dorsal surface of the abdomen, situated near to the proximal extremity.

Station 152, 1260 fathoms; Station 147, 1600 fathoms; Station 158, 1800 fathoms; Station 237, 1875 fathoms.

6. Eurycope pellucida, n. sp.

The present species is quite the largest of the family Munnopsidæ.

The single specimen (a male), from near New Guinea, measures 45 millim. in extreme length.

A remarkable peculiarity of this species is that the integument, instead of being firm and calcified as in Crustaceans generally, is delicate and transparent. The head is large and convex dorsally; the first segment of the thorax is very short; the second and third are subequal, and slightly longer than the first; the fourth segment is as long as the second and third taken together. All these segments are concave dorsally; they are furnished with short epimera. The segments themselves occupy a very small region of the body compared to other species; the length of the four segments taken together is only 5 millim., while that of the next three is 18 millim.

The three posterior segments of the thorax are approximately of equal size; their shape is not unlike that of other species of the genus.

The abdominal segment is large, but it is so collapsed that it is impossible to give an accurate description. It appears to resemble very closely that of *E. sarsii*; the posterior extremity is much bent down, so that on a lateral view the abdominal segment is semicircular in outline, the anus being directed downwards and even a trifle forwards.

The body of this species is entirely devoid of any spines.

All the thoracic appendages, as well as the antennæ, have been broken off short.

The mandibles are stout and powerful, and appear to be without a palp.

Station 218, 1070 fathoms.

7. Eurycope abyssicola, n. sp.

This species, like the last, is remarkable for the extreme delicacy and transparency of the integument; this character is almost more conspicuous in *E. abyssicola* than in *E. pellucida*.

The single specimen, which was dredged in the N. Atlantic, measures 40 millim. It presents a good many resemblances to *E. pellucida*.

The head is convex dorsally; the first four segments of the thorax are very short, and together measure no more than the fifth segment alone; they increase progressively in length. Of the three posterior segments of the body the middle one appears to be rather the largest, while the first and third are subequal. The abdominal segment is so damaged, that it is impossible to give any idea of its size and shape.

The mandibles have no palp.

The thoracic appendages of the first and sixth pairs have been preserved. The first pair appears to resemble the same appendages of other species of *Eurycope*; the sixth pair are modified into foliaceous swimmerets; but in these appendages only of the antepenultimate the flattened and dilated joint has been preserved; it is of comparatively enormous size.

Station 68, 2175 fathoms.

8. Eurycope spinosa, n. sp.

Another very remarkable form is the present species, which is unfortunately only represented by a fragment, dredged near the Antarctic ice-barrier from a depth of 1950 fathoms.

The head and the first four segments of the thorax (all that is left of the specimen) are subequal in length; each of the four thoracic segments is furnished with a long slender spine in the dorsal median line; the last three segments have in addition a pair of more laterally placed spines, which are absent from the first segment of the thorax but present upon the head, and situated a little way behind the articulation of the antennæ. On the epimera were also two or three long spines. The ventral side of the body is comparatively smooth; each of the segments, however, has a minute median spine nothing to compare with those on the dorsal surface, which equal or exceed in length the diameter of the body.

Station 157, 1950 fathoms.

Acanthocope, nov. gen.

Two individuals, apparently representing as many species of a Munnopsid from the southern hemisphere, I regard as the type of a new genus.

The characters of the genus may be stated in the following words:—

General form of the body oval; no marked difference in breadth between the anterior and posterior regions of the thorax. Anterior segments of the thorax increase progressively in length; the posterior segments of thorax subequal; epimera of all the thoracic segments from the second onwards enormously elongated into curved sickle-shaped spines. The abdominal segment is oval, with a long terminal spine nearly twice its own length and two pairs of lateral spines, one more anterior, the second overlying the articulation of the uropoda; from the inferior surface of the abdominal segment, beneath the articulation of the latter, arises another pair of long spines. Antennæ with the two basal joints short, and furnished with one or two long lateral spines. Mandibles divided into several tooth-like processes; molar process stout and powerful, with a blunt edge suitable for crushing; palp small and three-jointed. First two pairs or first pair only of legs shorter and more slender than the rest, the two or three following pairs subequal and not greatly elongated. Posterior thoracic appendages natatory. Uropoda long, styliform, 3- or 5-jointed.

1. Acanthocope spinicauda, n. sp.

A single male specimen was dredged between Kerguelen and Australia at a depth of 1800 fathoms.

It measures about 7 millim. in length, inclusive of the telson spine.

The general form of the body is oval; the first four segments of the thorax are short, gradually increasing in length up to the fourth; the three posterior segments are together twice as long as the four anterior; all the thoracic segments, with the exception of the first, are furnished with long spiniform epimera; on the first four thoracic segments is a single median spine, one on either side of the median line on each of the three succeeding segments. The abdomen is oval in shape, with an immensely elongated telson spine twice the length of the abdomen itself. On either side are a pair of lateral spines, the posterior being placed dorsal to the articulation of the uropoda; from the ventral surface of the caudal shield behind the uropoda arises another spine, which is shorter in this species than in the next to be described. The uropoda are 5-jointed.

Station 158, 1800 fathoms.

2. Acanthocope acutispina, n. sp.

A single specimen, apparently a female, of this species was dredged off the west coast of Patagonia.

The specimen measures 5 millim. in length.

It has the same general form as the last species; but the three posterior thoracic segments, instead of being together double the preceding thoracic segments, are only equal in length to the second, third, and fourth of these segments. The upper surface of the body in this species has not the median spines described in *Dolichurus spinicauda*. The epimeral spines are of comparatively much greater length than in the last-described species, and they, as well as the general body-surface, are closely beset with short spines; these structures are also present in *A. spinicauda*, but apparently not to so large an extent.

The abdomen has the same general form as in the last species; but the terminal spine of the telson is much shorter, being only about equal in length to the abdomen.

The two first appendages of the thorax are shorter as well as more slender than the succeeding.

The uropoda are 3-jointed.

Station 302, 1450 fathoms.

Geographical and Bathymetrical Distribution.

Although the Munnopsidæ dredged by the 'Challenger' were in nearly every cases from very deep water, the genera of this family do range into shallow water considerably above the 300-fathom line, which is supposed with reason to represent approximately the boundary line between the abyssal and shallow waters. Nearly all the species described by Sars are from comparatively shallow water, though several descend into water of 300 to 500 fathoms in depth, e. g. *Eurycope gigantea*, 525 fathoms. In the southern hemisphere only one species has been found to inhabit shallow water. A Munnopsid was obtained on the shores of Kerguelen, which are so productive in other Isopoda, notably in the genus *Serolis*; this is a species of the genus *Ilyarachna* which I have not at present determined with certainty.

The majority of the deep-sea species were obtained in the *vicinity* of land, for example, near to New Zealand and to the coast of South America. In many instances stations situated at vast distances from any land (such as Stations 157 and 158 between Australia and

Kerguelen in the southern hemisphere, and Station 252 in the middle of the North Pacific) yielded examples of the family. The distribution of this family over the floor of the ocean appears to be much wider than that of any other family of the Isopoda. While the genera *Serolis*, *Arcturus*, and others, of which the 'Challenger' obtained specimens from the deep sea, were almost invariably obtained in the immediate vicinity of land, this was by no means invariably the case with the Munnopsidæ.

The frequent occurrence of more than a single species at the same station appears to show that this family is largely represented in the abyssal fauna. At Station 146, for example, three distinct species were obtained, viz. *Eurycope sarsii*, *E. fragilis*, and *Munnopsis australis*.

The wide range of certain species is of importance. *Eurycope fragilis* ranges from Borneo in the north to near Kerguelen, and close to the antarctic ice-barrier in the south. *Acanthocope spinicauda* from Station 158 is represented off the west coast of Patagonia by *Acanthocope acutispina*, which only differs slightly from it. The greatest depth which any Munnopsid is known to inhabit is 2175 fathoms; a single specimen of *Eurycope abyssicola* was dredged from this depth at Station 68 in the Atlantic.

In my Report on the genus *Serolis* I pointed out that in *Serolis Bromleyana* and *S. antarctica*, which have a comparatively wide range, the individuals from the more southern localities are considerably larger than those that inhabit the more northern latitudes. This is strikingly shown in the case of *Eurycope fragilis*. The more southern forms of this species are considerably larger than the northern forms.

Nearly all the species of Munnopsidæ described by Sars and others are of comparatively puny dimensions, the largest being *Eurycope gigantea*, which attains the length of 33 millim. In striking contrast are many of the specimens obtained from deep water both in the northern and southern hemispheres by the 'Challenger;' as instances, may be mentioned *Eurycope pellucida*, which measures nearly 2 inches in length, and *E. fragilis*, which measures $1\frac{1}{2}$ inch. In this group, as in so many others which are represented both in deep and shallow water, the deep-sea species attain to the largest size.

Several of the new species described in the present paper are remarkable. *Eurycope spinosa* is unique by reason of the great development of spines upon the dorsal surface of the body; this character has not been met with in other Munnopsidæ, which have at most a covering of slender hairs, or a few spines, as in *Eurycope atlantica*. The development of spines upon the body is a character met with in other deep-sea Crustacea, though its meaning is not clear.

Another very remarkable species is the one which I have named *Eurycope pellucida*. As its name implies, it is transparent, the integument being thin and but little calcified; the condition of the specimen might naturally suggest that it had just changed its skin, if a well-developed colony of Hydroids upon some of the segments did not show this supposition to be erroneous. The extreme delicacy and fragility of the specimen has unfortunately resulted in the loss of nearly all the appendages, and the specimen is broken in half. It is not merely, however, the thinness and absence of calcification in the integument that makes this species so brittle; the muscles, both of the appendages and of the segments themselves, are so little developed that it is almost impossible to detect their presence with the unaided eye. This is the only family of Isopods in which I have observed a similar feeble development of the musculature, which is well known to be characteristic of many deep-sea fishes. *Eurycope fragilis* approaches *E. pellucida* in the transparency of the integument, and in the third species, *E. abyssicola* these peculiarities are even more developed; the specimen, however, is so collapsed and damaged that it is impossible to say much about it.

4. Descriptions of some new Species and a new Genus of Phytophagous Coleoptera. By Martin Jacoby.

[Received November 27, 1885.]

Doryphora prætextata, sp. nov.

Below piceous; above pale green. Head and the disk of the thorax piceous, closely punctured; elytra closely geminate, punctate-striate, a sutural stripe widened at the middle, piceous.

Length $4\frac{1}{2}$ lines.

Head finely and closely punctured; labrum fulvous; antennæ black, the three lower joints testaceous below, the apex of the terminal joint fulvous. Thorax very finely and rather closely punctured, the sides slightly rounded in front, nearly straight at the base, the angles acute but scarcely produced: a large piceous patch, widened at the base, occupies the middle of the disk. Scutellum piceous. Elytra rather finely punctate-striate; the punctures arranged in slightly irregular double rows, with the exception of the last row, near the lateral margins, which consist of single punctures only; the sutural longitudinal piceous stripe is distinctly widened at the middle, and gradually narrows towards the apices; the mesosternal process short and straight.

Hab. Amazons, St. Paulo d'Olivença. (Coll. Oberthür and my own.)

This species may easily be mistaken for a variety of *D. trivittata*, Baly, in which the lateral elytral stripe is wanting; but the double rows of punctures of the elytra show it to be distinct. In *D. trivittata*, as well as in *D. citrinella*, Kirsch, the elytra have single rows of punctures; the same is the case in *D. vespertina*, Baly, another closely allied species.

Doryphora gratiosa, sp. nov.

Black. Head, thorax, and antennæ dark piceous, the four last joints of the latter fulvous; elytra pale green, finely punctate-striate, the lateral and sutural margin, a spot at the shoulder, another below the base, and three placed transversely below the middle, dark brown.

Length 7 lines.

Head closely and finely punctured, the anterior margin of the labrum fulvous; antennæ extending to the base of the thorax, the seven lower joints piceous and shining, the four terminal ones and the sides of the two preceding fulvous, the apical joints slightly longer than broad. Thorax nearly three times as broad as long, the sides nearly straight at the base, rounded towards the apex, the anterior angles acute; surface punctured like the head, but the punctures more remotely placed. Scutellum impunctate, piceous. Elytra closely and finely punctured, the punctuation arranged in irregular double and treble lines, and surrounded by a ring of darker green than that of the ground-colour, the sutural and lateral margins narrowly piceous, this colour widened below the base at the suture into a triangular-shaped broad spot; a similarly coloured small spot is placed at the sides and close to the latter, another one at the shoulder, and three placed transversely below the middle at the disk of each elytron; mesosternal process short and stout.

Hab. Amazons, St. Paulo d'Olivença. (Coll. Oberthür and my own.)

In the pattern of the elytra *D. gratiosa* resembles *D. imperialis*, Stäl, and *D. hybrida*, Jac., but differs entirely in its coloration and the fulvous apical joints of the antennæ.

DORYPHORA OBERTHURI, sp. nov.

Below greenish black; above metallic blue. Thorax dilated at the sides, wider than the elytra, remotely punctured; elytra closely and semiregularly punctate-striate.

Length 8 lines.

Head finely and rather closely punctured, metallic green or blue; the anterior margin of the labrum and the jaws covered with long yellowish hairs; antennæ not extending much further than the base of the elytra, the first six joints metallic blue, the rest black. Thorax wider than the elytra, the sides very greatly rounded and widened towards the base, the posterior margin produced towards the middle; surface covered with larger and smaller punctures, irregularly and not very closly placed, the dilated sides entirely impunctate, the lateral margin accompanied by a single row of deep punctures. Scutellum about as broad as long, impunctate. Elytra very convex and parallel, narrower at the base than the thorax, the disk rather closely punctate-striate, the punctures, however, not very regularly placed and greatly diminishing in size towards the apices; the interstices impunctate, here and there aciculate; the breast black; the abdomen and legs metallic green; the mesosternal process rather short, but slightly curved and ending in a slightly thickened point.

Hab. Amazons, St. Paulo d'Olivença. (Coll. R. Oberthür and Jacoby.)

Allied to *D. dilaticollis* and *D. euchalca*, Stäl; but distinguished by the extremely rounded, not angulate, sides of the thorax, and by the much stronger punctuation of the elytra, which is plainly visible with the naked eye.

DORYPHORA PICTIPENNIS, sp. nov.

Black. Thorax with strongly rounded sides, the latter closely punctured; elytra testaceous, irregularly and closely covered with numerous small black spots.

Length $8\frac{1}{2}$ lines.

Head extremely finely punctured, the lower edge of the epistome and the anterior margin of the labrum sometimes testaceous; antennæ scarcely extending beyond the base of the thorax, black, the apices of the first two joints sometimes testaceous, the third joint very long and slender, the five lower joints shining, the rest opaque, pubescent, and longer than broad. Thorax very transverse, about three times as broad as long, the sides strongly rounded, the angles acutely produced, the anterior ones toothed; surface deeply and rather closely punctured at the sides, the middle of the disk nearly impunctate. Scutellum triangular; the apex acute, impunctate. Elytra covered with very numerous small punctures, each of which is surrounded by a black ring; at the basal margin there are some larger greenish æneous spots; the extreme lateral and sutural margin is also black, as well as the elytral epipleuræ; mesosternal process stout and straight.

Hab. Amazons, St. Paulo d'Olivença. (Coll. Oberthür and my own.)

This species will find its place near *D. glomerata*, Stäl, *D. pluviata*, Baly, and several others somewhat similarly marked; the absence of any transverse or longitudinal elytral bands will distinguish it.

DEUTEROCAMPTA DISCICOLLIS, sp. nov.

Flavous or fulvous; the sides of the breast, the disk of the thorax, and two transverse bands of the elytra, as well as a large triangular spot at the apices of the latter, black.

Length 3–$3\frac{1}{2}$ lines.

Head with a few fine punctures and a distinct longitudinal central groove; antennæ short, entirely fulvous, the terminal joints slightly thickened. Thorax more than three times as broad as long, the sides straight at the base, rounded towards the apex; surface very finely and rather remotely punctured, the middle of the disk black, the sides fulvous. Scutellum fulvous. Elytra regularly and finely punctate-striate, the punctures distinct to the apex, fulvous; a narrow transverse band at the base extending to either margin, a much broader band at the middle, abbreviated at either margin, and a broad triangular spot near the apex of each elytron, black; elytral epipleuræ, the underside (with the exception of the sides of the breast) and the legs fulvous.

Hab. Amazons, St. Paulo d'Olivença. (Coll. Oberthür and my own.)

The elytra, if the black colour is taken for that of the ground, have the margins and two narrow transverse bands (one before, the other below, the middle) fulvous.

LICYLLUS, gen. nov. (HALTICINÆ).

Body ovate; eyes entire; antennæ filiform, the second joint short. Thorax transverse, narrow, the posterior angles tuberculiform, oblique; surface transversely depressed at the middle of the disk. Scutellum large, the apex rounded. Elytra with a deep depression below the base, irregularly punctured, their epipleuræ disappearing below the shoulders. Posterior femora strongly incrassate, their tibiæ simple and unarmed, the first joint of the posterior tarsi as long as the three following joints together. Claws appendiculate. Prosternum invisible between the coxæ; mesosternum narrowly transverse. Anterior coxal cavities open.

The unarmed apices of all the tibiæ, the transversely impressed thorax, and the absence of the elytral epipleuræ below the middle, in connection with the deeply depressed space of the elytra below the base, form a number of characters which distinguish *Licyllus* from any other genus amongst the numerous family of Halticinæ. A single species from Australia is known to me.

LICYLLUS SPLENDIDUS, sp. nov.

Piceous. Basal joints of the antennæ, the thorax, anterior legs, and posterior tibiæ testaceous; elytra metallic green, two large spots at the base, and a semicircular mark below the middle of each elytron bright reddish cupreous.

Length 2 lines.

Head piceous, with a few fine punctures; the frontal tubercles strongly raised, bounded behind by a rather deep groove; the carina very indistinct; lower part of face testaceous. Antennæ more than half the length of the body, obscure fuscous, the four or five lower joints testaceous, the third joint more than twice as long as the second and longer than the fourth. Thorax three times as broad as long, the sides rounded at the middle, the angles, especially the posterior ones, produced in a tubercle, obliquely shaped behind the latter; surface impunctate, with a rather deep transverse groove across the disk, not extending to the sides. Scutellum broad, black. Elytra widened below the middle, transversely depressed below the base, the latter raised; surface closely and finely punctured, the punctures more strongly impressed anteriorly than behind the middle, metallic green; an elongate spot placed at the shoulders, which are prominent, a round spot near the scutellum, and a large semicircular ring, occupying nearly the entire latter half of each elytron, brilliant reddish cupreous; posterior femora piceous, the rest of the legs testaceous.

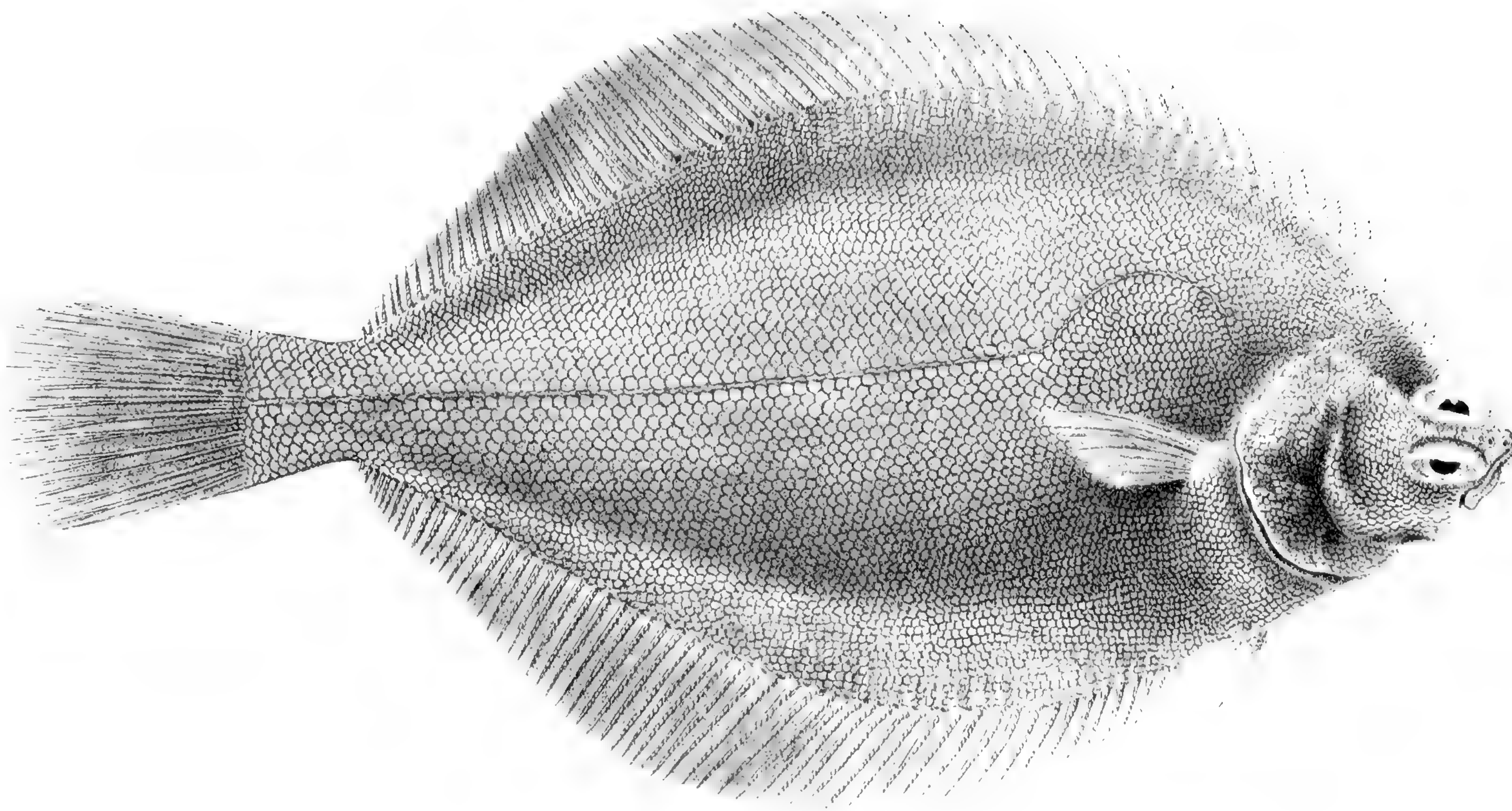
Hab. Australia. (Two specimens are contained in my collection.)

DIACANTHA OBERTHURI, sp. nov.

Fulvous; the sides of the breast black; elytra distinctly punctured, their anterior half and a triangular spot near the apices black.

Length 3 lines.

Head impunctate, transversely grooved behind the frontal tubercles; antennæ rather short and stout, fulvous, the third joint slightly longer than the second; sides of the thorax subangulate



P. Smit lith.

Hanhart imp.

SUPPOSED HYBRID BETWEEN THE DAB, (Pleuronectes limanda.)
AND THE FLOUNDER, (P. Flesus.)

before the middle, the surface impressed with a transverse groove, interrupted at the middle, finely punctured within the groove, the rest of the surface impunctate. Scutellum fulvous. Elytra closely and finely but distinctly punctured, the entire anterior portion to slightly below the middle black, but this colour not quite extending to the shoulders, which remain of the fulvous ground-colour; a triangular black spot is placed close to the apex of each elytron. Underside and legs fulvous; the sides of the breast very narrowly marked with black.

Hab. Agouë (*Benin*). (Coll. Oberthür and my own.)

This species, although evidently closely allied to *D. aperta*, Harold, seems to differ sufficiently to justify its separation. The elytra in *D. oberthuri*, besides being closely punctured, of which Von Harold makes no mention, are devoid of any basal elevation; their black anterior portion will separate the species from *D. aperta* and several other allied forms in which the elytral bands are narrow.

DIACANTHA VIRIDIPENNIS, sp. nov.

Fulvous; terminal joints of the antennæ and the tarsi black; elytra closely punctured, metallic green.

Length $2\frac{1}{2}$ lines.

Head impunctate, with the usual transverse groove between the eyes; antennæ with the four first joints fulvous, the rest black, third and following joints equal. Thorax about twice as broad as long, the sides very slightly rounded in front, the disk with a deep transverse groove, not interrupted at the middle. Scutellum fulvous. Elytra without any basilar elevation, closely and distinctly punctured, entirely metallic green. Underside and legs fulvous; tarsi black; claws appendiculate; anterior coxal cavities open.

Hab. Africa, Quanauga Strom (*Major v. Mechow*). (Coll. Oberthür and my own.)

5. On a supposed Hybrid between the Dab (*Pleuronectes limanda*) and the Flounder (*P. flesus*). By F. DAY, F.Z.S.

[Received November 27, 1885.]

(Plate LXII.)

On November 20th my attention was arrested at a fishmonger's shop in Cheltenham by a curious-looking pleuronectoid fish with the following characters and dimensions:—

D. 74. P.r. 11, L. 9. V.r. 6, l. 6. A. 60. C. 14. L. l. 92.

Entire length	15	inches
Length of head	2·9	„
Length of caudal fin	2·4	„
Height of body	6·4	„

Eyes on right side, diameter 0·6 in.; 0·2 apart; 0·5 from end of nout. The lower jaw slightly in advance of the upper; the maxilla as long as the eye. The greatest depth of the body is between the lateral line and the base of the anal fin, where it is 3·4 inches. *Teeth.* Conical, with rounded summits, in two rows on the blind side in the upper jaw, and one on the coloured; smaller and fewer in the mandible. *Gill-rakers* removed. *Fins,* dorsal fin commences above the middle of the upper eye, its 32nd ray as high as any; it and a few beyond are each 1·5 of an inch in length and half as long as the head. A spine before the base of the anal fin; caudal fin similar to that of the Flounder. Free portion of the tail two thirds as long as high. *Scales* indistinctly ctenoid on the coloured side, cycloid on the blind side; they are extended over the cheeks and on the ridge between the eyes; there is also a row of them along each dorsal and anal ray. No osseous tubercles along the bases of dorsal or anal rays. *Lateral-line* with a strong curve anteriorly over the base of the pectoral fin, 1·6 inches in length and 0·7 of an inch high. *Colour* of a dark brown without spots, and white on the lower surface; the first portion of the dorsal fin whitish, also a narrow white edging along its first half, caudal also with a narrow white outer edge.

The number of rays, the ctenoid scales which are continued along the vertical rays, and the strong curve at the commencement of the lateral line point out to one of the parents of this fish being the Dab (*Pleuronectes limanda*), while the other must be a Flounder or a Plaice. The size of the fish, the absence of ossicles along the bases of the vertical fin-rays, and the number composing the anal fin at first led me to suppose the other parent might be a Plaice; but the dentition and the square-cut tail, as well as absence of spots, induces me to conclude that it must have been a Flounder. It came from Brixham.

While alluding to this specimen, I would suggest that *Pleuronectes pseudoflesus* of Gottsche, Wiegm. Arch. 1835, pt. ii. p. 143, may probably be a hybrid Flounder.

The drawing (Pl. LXII.) represents the specimen at five elevenths of the natural size.

6. Notes on the Antelopes of Somali-Land. By E. Lort Phillips, F.Z.S.

[Received December 1, 1885.]

At the meeting of this Society on the 18th of November last year[1] Mr. Sclater read an excellent paper containing an account of some flat skins of Somali Antelopes and other Mammals which had been sent to him by Mr. C. Hagenbeck, the well-known dealer of Hamburg. Having recently visited Somali-land, along with my friends Messrs. James, Aylmer, and Thrupp, and obtained specimens of several species of Antelopes, I think it may interest the members of the Society if I exhibit the heads of the specimens that we have procured, and read a few notes on the country, of which very little seems to be known.

We left Berbereh on the 22nd of December, 1884, and travelled

[1] See P. Z. S. 1884, p. 538.

nearly due south for about 300 miles, returning to our starting-point on the 16th of the following April. For the first eight miles after leaving the coast we crossed a flat sandy plain, thinly covered with dwarf Mimosas, and then ascended a plateau or tableland of about 3000 feet above the sea-level.

This plateau extends to the south for about 280 miles, and there ends as abruptly as on the north, the descent on both sides being very rapid. At the south margin of the plateau runs the Webbe-Shebeyli or Haynes River, through an immense plain. The banks of this river are extensively cultivated by the natives, who grow corn, beans, and water-melons. To any one wishing to know more of the country I would recommend a reference to Mr. F. L. James's account of this journey read before the Royal Geographical Society on the 29th of June of the present year (see Proc. R. Geogr. Soc. 1885, p. 625).

The following Antelopes were met with during our expedition. Mr. Sclater has determined the species for me.

1. Strepsiceros imberbis. (*Lesser Koodoo*).

This beautiful little Koodoo is found on the northern slopes of the plateau. It does not seem to differ much in its habits from the larger Koodoo: it is fond of thick covert, and I do not think it likely that it would be found very far from water. I exhibit a fine head of a male.

2. Strepsiceros kudu. (*Greater Koodoo.*)

We did not meet with this species till we reached the southern slopes of the plateau, where it was said by the natives to be fairly plentiful. One example only was procured, a very fine male.

3. Oryx beisa. (*Beisa Antelope.*)

This animal is highly prized by the Somali, as from its hide, which is very tough, are made their beautiful little shields, and its long pointed horns are used for loosening the earth during the tedious process of sinking wells.

During the rainy season the natives hunt these Antelopes on horseback, and they are easily ridden down, as they are then fat and heavy and their feet sink deep into the wet earth. In the dry season, owing, I suppose, to being hunted so much, it is extremely hard to approach them, and when once disturbed they gallop a long way without stopping. The head on the table is that of a female shot on the plateau.

4. Gazella walleri. (*Waller's Gazelle.*)

I have here to-night heads of both male and female of this species. The female is without horns. When seen from a distance this Antelope might easily be mistaken for a Giraffe, on account of its long thin neck. It was found to be fairly plentiful throughout our journey.

5. Gazella spekii. (*Speke's Gazelle.*)

These Gazelles are very plentiful on the low plain near Berbereh, where they may be seen in herds varying from three to ten in number. I did not notice any on the plateau.

6. Gazella, sp. inc. (*Flabby-nosed Gazelle*[1].)

This Gazelle was shot on the plateau towards the beginning of April. It is remarkable for having a quantity of loose skin on the nose. The Gazelles on the plateau seemed to me to differ greatly from those on the plain by the coast, as the black mark along the side was entirely wanting; they also looked much lighter in colour, in fact almost white.

I shot a female apparently of this species, but did not notice the extraordinary development of the skin of the nose as presented by the male.

7. Gazella sœmmerringi. (*Sœmmerring's Gazelle.*)

This Antelope we thought to be of a new species, as it seemed larger than the Sœmmerring's Gazelles that we met with in the Bogos country in our former expedition; the horns certainly are much larger. It is extremely plentiful on the plateau, some of the herds numbering one hundred at least. Where these Antelopes drank, if they drank at all, is a mystery to me, as the only water obtainable on the plateau during the dry season is from wells about forty feet deep.

8. Cobus, sp. inc.[2] (*Water-buck.*)

We did not meet with this Antelope till we reached the banks of Webbe Shebeyli, where it was fairly plentiful among the thick jungle near the river. Its hide is much prized by the natives for making ropes, but the flesh they refuse to touch.

9. Neotragus, sp. inc.[3] (*Dwarf Antelope.*)

These little animals were very abundant on the plateau. On being disturbed they bound off with great jumps, uttering a shrill cry. Their flesh tasted strongly of musk, but for want of other meats we had continually to eat it. I often got two or three at a time, with an ordinary charge of shot.

10. Alcelaphus, sp. inc. (*Hartebeest.*)

In the first week in April near the northern boundary of the plateau I shot a young male Hartebeest. I unfortunately lost the skull. It was the only time we ever saw any of this species.

[1] [This Gazelle, I think, belongs probably to a new species, but requires further examination.—P. L. S.]

[2] [No specimens were brought home of this Antelope, which was probably either *C. mipsiprymnus* or an allied species.—P. L. S.]

[3] [This is a close ally of *Neotragus saltianus*, but perhaps different.—P. L. S.]

APPENDIX.

LIST OF ADDITIONS TO THE SOCIETY'S MENAGERIE

DURING THE YEAR

1885.

Jan. 1. 1 Siamese Gibbon (*Hylobates pileatus*). Purchased.
1 Brown Hyæna (*Hyæna brunnea*). Presented by R. W. Murray, Esq.
2. 7 Angulated Tortoises (*Chersina angulata*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
2 Hoary Snakes (*Coronella cana*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Many-spotted Snake (*Coronella multimaculata*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Robben-Island Snake (*Coronella phocarum*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
3. 1 Raven (*Corvus corax*). Presented by the Rev. W. G. Lewis.
5. 1 Short-toed Eagle (*Circaetus gallicus*). Presented by Capt. H. E. Robbins.
6. 1 Pig-tailed Monkey (*Macacus nemestrinus*), ♂. Presented by J. Church-Dixon, Esq.
1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by J. Church-Dixon, Esq.
1 Vulpine Phalanger (*Phalangista vulpina*), ♀. Presented by J. Church-Dixon, Esq.
1 Tuberculated Iguana (*Iguana tuberculata*). Purchased.
1 Lacertine Snake (*Cœlopeltis lacertina*). Presented by R. F. Sibbald, Esq.
8. 1 Rose-crested Cockatoo (*Cacatua molluccensis*). Deposited.
9. 1 Vulpine Phalanger (*Phalangista vulpina*). Born in the Menagerie.
10. 1 Mouflon (*Ovis musimon*), ♂. Presented by H.R.H. The Duke of Edinburgh, K.G.
1 Black-and-Yellow Hawfinch (*Mycerobas melanoxanthus*), ♀. Purchased. See P. Z. S. 1885, p. 168.
1 Andaman Starling (*Sturnia andamanensis*). Purchased. See P. Z. S. 1885, p. 168.

Jan. 10. 4 Starred Tortoises (*Testudo stellata*). Purchased. See P. Z. S. 1885, p. 168.
11. 1 Vulpine Phalanger (*Phalangista vulpina*). Presented by B. C. Parr, Esq.
12. 1 Brush-tailed Kangaroo (*Petrogale penicillata*), ♂. Deposited.
13. 1 Red-handed Tamarin (*Midas rufimanus*). Deposited.
14. 1 Nilotic Crocodile (*Crocodilus vulgaris*). Presented by H. E. Cree, Esq.
16. 2 Striated Tanagers (*Tanagra striata*). Purchased.
2 Siskins (*Chrysomitris spinus*). Purchased.
1 Crossbill (*Loxia curvirostra*). Presented by Mr. G. Skegg.
1 Golden-crowned Conure (*Conurus aureus*). Deposited.
17. 1 Virginian Fox (*Urocyon virginianus*). Received in Exchange.
1 Golden Eagle (*Aquila chrysaetus*). Presented by Col. E. D. Hunt.
7 Bramblings (*Fringilla montifringilla*). Presented by Mr. T. E. Gunn.
2 Chaffinches (*Fringilla cœlebs*). Presented by Mr. T. E. Gunn.
1 Tree-Sparrow (*Passer montanus*). Presented by Mr. T. E. Gunn.
1 Black-headed Bunting (*Emberiza melanocephala*). Presented by Mr. T. E. Gunn.
21. 6 Dunlins (*Tringa alpina*). Purchased.
22. 1 Moose (*Alces machlis*), ♂. Presented by Evelyn Hubbard, Esq. See P. Z. S. 1885, p. 168.
23. 2 Yaks (*Poephagus grunniens*), ♂ ♀. Purchased. See P. Z. S. 1885, p. 168.
1 Goshawk (*Astur palumbarius*). Presented by W. H. St. Quintin, Esq.
24. 1 Pink-footed Goose (*Anser brachyrhynchus*). Presented by Major H. W. Feilden, C.M.Z.S.
26. 1 Malayan Tapir (*Tapirus indicus*), ♂. Deposited.
2 Calandra Larks (*Melanocorypha calandra*). Purchased.
28. 2 White Storks (*Ciconia alba*). Deposited.
5 Striped Snakes (*Tropidonotus sirtalis*). Born in the Menagerie.
29. 2 Long-eared Owls (*Asio otus*). Presented by George E. Crisp, Esq.
1 Tawny Owl (*Syrnium aluco*). Presented by George E. Crisp, Esq.
31. 2 Magpies (*Pica rustica*). Deposited.
1 Sambur Deer (*Cervus aristotelis*), ♂. Presented by the Officers 1st Batt. Essex Regiment.
1 Malbrouck Monkey (*Cercopithecus cynosurus*), ♂. Presented by Mrs. East.

Feb. 2. 1 Green Monkey (*Cercopithecus callitrichus*), ♀. Presented by F. W. Robinson, Esq.
1 Royal Python (*Python regius*). Presented by A. H. Berthoud, Esq.
3. 1 Long-eared Owl (*Asio otus*). Presented by R. Farren, Esq.
5. 2 Kagus (*Rhinochetus jubatus*). Purchased.
1 Black Hornbill (*Sphagolobus atratus*), ♂. Received in Exchange.
9. 2 Long-fronted Gerbilles (*Gerbillus longifrons*). Born in the Menagerie.

Feb. 10. 1 Viverrine Phalanger (*Phalangista viverrina*), ♀. Purchased. See P.Z.S. 1885, p. 245.

2 Stanley Parrakeets (*Platycercus icterotis*), jr. Purchased. See P.Z.S. 1885, p. 245.

12. 1 Common Boa (*Boa constrictor*). Presented by Mr. Allen.

13. 2 Hooded Crows (*Corvus cornix*). Presented by Miss Muriel Agnes Brassey.

2 Laughing Kingfishers (*Dacelo gigantea*). Presented by Miss Marie Adelaide Brassey.

1 Sharp-nosed Crocodile (*Crocodilus acutus*). Presented by C. G. Brown, Esq., M.R.C.S.

1 Globose Curassow (*Crax globicera*), ♂. Purchased.

16. 2 Malayan Squirrels (*Sciurus nigro-vittatus*). Purchased.

1 Four-horned Antelope (*Tetraceros quadricornis*), ♀. Purchased.

1 Golden-winged Woodpecker (*Colaptes auratus*). Purchased.

1 Pine-Grosbeak (*Pinicola enucleator*). Purchased.

1 Brazilian Teal (*Querquedula brasiliensis*), ♀. Purchased.

17. 1 Serval (*Felis serval*), ♂. Presented by T. J. Alldridge, Esq., F.Z.S.

1 African Civet Cat (*Viverra civetta*), ♂. Presented by T. J. Alldridge, Esq., F.Z.S.

2 Pileated Jays (*Cyanocorax pileatus*). Presented by Theo. Walsh, Esq.

19. 4 Long-fronted Gerbilles (*Gerbillus longifrons*). Born in the Menagerie.

1 Roseate Cockatoo (*Cacatua roseicapilla*). Deposited.

20. 1 Common Badger (*Meles taxus*), ♀. Presented by Cuthbert Johnson, Esq.

21. 2 Common Foxes (*Canis vulpes*), 2 ♂. Presented by Lady Brassey, F.Z.S.

23. 1 Alexandrine Parakeet (*Palæornis alexandrini*), ♀. Presented by Mr. W. Hay.

24. 1 Hybrid Nubian Ibex (between ♂ *Capra nubiana* and ♀ *Capra hircus*), ♀. Born in the Menagerie.

1 Short-tailed Wallaby (*Halmaturus brachyurus*). Deposited.

26. 1 Slow-worm (*Anguis fragilis*). Presented by R. Gunter, Esq.

27. 1 Isabelline Lynx (*Felis isabellina*), ♂. Received in Exchange. See P. Z. S. 1885, p. 245.

28. 2 Brown Pelicans (*Pelecanus fuscus*). Purchased. See P. Z. S. 1885, p. 246.

2 Wood-Hares (*Lepus sylvaticus*). Presented by F. J. Thompson, Esq.

2 Spotted Ichneumons (*Herpestes nepalensis*). Presented by Mr. R. Wilkins.

1 Common Magpie (*Pica rustica*). Presented by Mr. H. Clare.

Mar. 2. 3 Coal-Tits (*Parus ater*). Purchased.

4. 1 Dwarf Common Ass (*Equus asinus*), ♂. Presented by J. Skelding, Esq.

1 Alexandrine Parrakeet (*Palæornis alexandri*), ♂. Presented by Mrs. Abbott.

5. 1 Roan Kangaroo (*Macropus erubescens*), ♀. Purchased. See P. Z. S. 1885, p. 322.

6. 1 Bonnet-Monkey (*Macacus sinicus*), ♂. Presented by Mrs. M. Strachan Crnegie.

Mar. 6. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by Mrs. M. Strachan Carnegie.
7. 2 Common Gulls (*Larus canus*). Presented by F. J. Mosely, Esq., F.Z.S.
2 Black-headed Gulls (*Larus ridibundus*). Presented by F. J. Mosely, Esq., F.Z.S.
9. 1 Palm-Squirrel (*Sciurus palmarum*). Presented by Lieut. A. H. Oliver, R.N.
1 Red-eared Monkey (*Cercopithecus erythrotis*), ♂. Purchased.
1 Pluto Monkey (*Cercopithecus pluto*), ♀. Purchased.
1 White-thighed Colobus (*Colobus vellerosus*), ♂. Purchased.
1 Blood-stained Cockatoo (*Cacatua sanguinea*). Purchased.
10. 1 Bonnet-Monkey (*Macacus sinicus*), ♀. Presented by Mrs. Thomas.
1 Barn-Owl (*Strix flammea*). Presented by Mr. W. P. Clark.
11. 1 Hairy-nosed Wombat (*Phascolomys latifrons*), ♀. Purchased.
12. 1 Redwing (*Turdus iliacus*). Purchased.
1 Cirl-Bunting (*Emberiza cirlus*). Purchased.
4 Bramblings (*Fringilla montifringilla*). Purchased.
4 Reed-Buntings (*Emberiza schœniclus*). Purchased.
1 Indian Crocodile (*Crocodilus palustris*). Presented by Mr. John Murphy.
13. 3 Long-fronted Gerbilles (*Gerbillus longifrons*). Born in the Menagerie.
14. 1 Grey Ichneumon (*Herpestes griseus*). Presented by J. G. Baxter, Esq.
1 Vulpine Phalanger (*Phalangista vulpina*). Presented by J. G. Baxter, Esq.
1 Algerian Tortoise (*Testudo mauritanica*). Deposited.
1 Common Boa (*Boa constrictor*). Presented by Mr. Allen.
1 Red-billed Whistling Duck (*Dendrocygna autumnalis*). Presented by Wm. Boutcher, Esq.
18. 1 Malbrouck Monkey (*Cercopithecus cynosurus*). Presented by Mr. W. E. Clift.
1 Stein-bok Antelope (*Nanotragus tragulus*), ♀. Purchased.
19. 1 Vervet Monkey (*Cercopithecus lalandii*). Presented by W. Ockey, Esq.
1 Pine-Marten (*Mustela martes*). Presented by Frank Sharp, Esq.
20. 4 Wattled Starlings (*Dilophus carunculatus*), 2 ♂, 2 ♀. Purchased. See P. Z. S. 1885, p. 322.
2 Brazilian Tanagers (*Ramphocœlus brasilius*), 2 ♂. Purchased.
2 Superb Tanagers (*Calliste fastuosa*). Purchased.
2 White-throated Seed-eaters (*Crithagra albogularis*), ♂ ♀. Purchased.
2 Cape Colies (*Colius capensis*). Purchased. See P. Z. S. 1885, p. 322.
1 Narrow-barred Finch (*Munia nisoria*). Presented by Mr. J. Abrahams.
2 St.-Helena Seed-eaters (*Crithagra butyracea*), ♂ ♀. Presented by Mr. J. Abrahams.
1 Grey-necked Serin Finch (*Serinus canicollis*), ♂. Presented by Mr. J. Abrahams.
1 Brown Canary Finch (*Serinus tottus*). Presented by Mr. J. Abrahams.
2 Yellowish Finches (*Sycalis luteola*). Presented by Mr. J. Abrahams.

Mar. 21. 2 Pheasants (*Phasianus colchicus*), 2 ♀. Deposited.
23. 1 Russ's Weaver-bird (*Quelea russi*), ♂. Presented by Mr. J. Abrahams.
24. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Miss Payne Hamilton.
1 Long-eared Owl (*Asio otus*). Presented by Scott B. Wilson, Esq.
1 Common Kestrel (*Tinnunculus alaudarius*). Presented by Scott B. Wilson, Esq.
1 Common Buzzard (*Buteo vulgaris*). Presented by Scott B. Wilson, Esq.
25. 1 Common Otter (*Lutra vulgaris*). Purchased.
1 Raven (*Corvus cornix*). Presented by J. Bradley, jun., Esq.
26. 1 Raven (*Corvus cornix*). Presented by G. Sloper, Esq.
27. 2 Wattled Starlings (*Dilophus carunculatus*), ♂ ♀. Purchased. See P. Z. S. 1885, p. 322.
28. 1 Blau-bok (*Cephalophus pygmæus*), ♂. Presented by A. Best, Esq.
29. 1 Common Lizard (*Lacerta vivipara*). Presented by Stanley S. Flower, Esq.
31. 8 Silky Bower-birds (*Ptilonorhynchus violaceus*). Received in Exchange.
2 Common Wombats (*Phascolomys wombat*). Received in Exchange.
2 Red Kangaroos (*Macropus rufus*), ♂ ♀. Received in Exchange.
2 Great Kangaroos (*Macropus giganteus*), ♂ ♀. Received in Exchange.
1 Roan Kangaroo (*Macropus erubescens*), ♀. Received in Exchange. See P. Z. S. 1885, p. 322.
2 Bennett's Wallabys (*Halmaturus benetti*). Received in Exchange.

April 1. 2 Sumatran Rhinoceroses (*Rhinoceros sumatrensis*), ♂ ♀. Purchased. See P.Z.S. 1885, p. 421.
1 Bar-tailed Pheasant (*Phasianus reevesi*), ♂. Purchased.
1 Silver Pheasant (*Euplocamus nycthemerus*), ♀. Purchased.
1 Rufous-tailed Pheasant (*Euplocamus erythrophthalmus*), ♀. Purchased.
2 Peacock Pheasants (*Polyplectron chinquis*), 2 ♀. Purchased.
1 Cocoi Heron (*Ardea cocoi*). Purchased.
2. 1 Rhesus Monkey (*Macacus rhesus*), ♂. Presented by Mr. F. J. Edmonds,
1 Bonnet Monkey (*Macacus radiatus*). Born in the Menagerie.
1 Black Lemur (*Lemur macaco*). Born in the Menagerie.
3. 1 Common Seal (*Phoca vitulina*). Presented by the National Fish-Culture Association.
4. 1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Deposited.
7. 1 Tibetan Wild Ass or Kiang (*Equus hemionus*), ♀. Deposited. See P. Z. S. 1885, p. 421.
1 Common Otter (*Lutra vulgaris*). Presented by Sackville Phelps, Esq.
1 Common Otter (*Lutra vulgaris*). Deposited.
1 Mandarin Duck (*Æx galericulata*), ♂. Purchased.
8. 1 White-fronted Lemur (*Lemur albifrons*). Born in the Menagerie.

April 8. 2 Common Guinea-fowls (*Numida meleagris*). Deposited.
1 Galeated Curassow (*Pauxis galeata*), ♂. Presented by G. A. Crawley, Esq.
1 Wheatear (*Saxicola œnanthe*), ♀. Purchased.
9. 1 Pig-tailed Monkey (*Macacus nemestrinus*), ♀. Presented by Mrs. Urquhart.
1 Carrion-Crow (*Corvus corone*). Presented by A. Browning Priestly, Esq.
1 Chilian Sea-Eagle (*Geranoaetus melanoleucus*). Presented by Richard J. Jones, Esq.
1 Smooth Snake (*Coronella lævis*). Presented by W. H. B. Pain, Esq.
10. 1 Chinese Mynah (*Acridotheres cristatellus*). Presented by George Rowles, Esq.
1 Gigantic Salamander (*Megalobatrachus giganteus*). Deposited.
2 Bull Frogs (*Rana catesbiana*). Purchased.
1 Dark Green Snake (*Zamenis atrovirens*). Purchased.
6 Agile Frogs (*Rana agilis*). Purchased.
11. 4 Sonnerat's Jungle-fowls (*Gallus sonnerati*), 2 ♂, 2 ♀. Deposited.
13. 10 Common Squirrels (*Sciurus vulgaris*). Purchased.
1 Toco Toucan (*Ramphastus toco*). Deposited.
2 Guira Cuckoos (*Guira piririgua*). Purchased.
1 Brazilian Caracara (*Polyborus brasiliensis*). Purchased.
14. 1 Campbell's Monkey (*Cercopithecus campbelli*), ♀. Presented by Miss Lyster.
1 Emu (*Dromæus novæ-hollandiæ*). Presented by Capt. J. E. Erskine, R.N.
16. 1 Wild Boar (*Sus scrofa*), ♀. Purchased.
4 Mandarin Ducks (*Æx galericulata*), 2 ♂, 2 ♀. Purchased.
2 Summer Ducks (*Æx sponsa*), ♂ ♀. Purchased.
1 Swinhoe's Pheasant (*Euplocamus swinhoii*), ♂. Purchased.
3 Black Swans (*Cygnus atratus*). Hatched in the Gardens.
17. 2 Macacque Monkeys (*Macacus cynomolgus*), ♂ and ♀. Presented by A. J. M'Cowans, Esq.
2 Turtle-Doves (*Turtur communis*). Presented by Miss Reinhold.
18. 1 Common Badger (*Meles taxus*). Deposited.
2 Gouldian Grass-Finches (*Poëphila gouldiæ*), 2 ♂. Presented by Chas. N. Rosenfeld, Esq. See P. Z. S. 1885, p. 421.
1 Common Spoonbill (*Platalea leucorodia*). Purchased.
4 Pintails (*Dafila acuta*), 2 ♂, 2 ♀. Deposited.
4 Summer Ducks (*Æx sponsa*), 2 ♂, 2 ♀. Deposited.
2 Spotted-billed Ducks (*Anas pœcilorhyncha*), ♂ ♀. Deposited.
20. 1 Suricate (*Suricata tetradactyla*). Presented by Miss F. M. Savill.
2 Common Badgers (*Meles taxus*). Presented by Lord Willoughby de Broke.
1 Alligator (*Alligator mississippiensis*). Presented by Miss Heimlicher.
21. 1 Red-tailed Amazon (*Chrysotis erythrura*). Purchased.
22. 1 Mealy Amazon (*Chrysotis farinosa*). Presented by W. Hodder, Esq.
3 Upland Geese (*Bernicla magellanica*), 3 ♂. Purchased.
3 Wigeon (*Mareca penelope*). Purchased.
23. 1 Common Marmoset (*Hapale jacchus*). Presented by Miss Henderson.

Apr. 23. 2 Alligators (*Alligator mississippiensis*). Presented by Chas. Ridley, Esq.

24. 1 Cereopsis Goose (*Cereopsis novæ-hollandiæ*). Presented by F. L. Frodsham, Esq.

1 Black Swan (*Cygnus atratus*). Presented by F. L. Frodsham, Esq.

27. 1 Yellow Baboon (*Cynocephalus babouin*). Presented by Mrs. Wilson.

1 Common Squirrel (*Sciurus vulgaris*). Purchased.

5 Coypus (*Myopotamus coypus*). Born in the Menagerie.

1 Crested Pigeon (*Ocyphaps lophotes*). Presented by J. Harrison, Esq.

1 Common Lizard (*Lacerta vivipara*). Presented by Masters W. B. and A. S. Cotton.

28. 1 Glaucous Gull (*Larus glaucus*). Presented by G. Edson, Esq.

1 Common Viper (*Vipera berus*). Presented by W. H. B. Pain, Esq.

12 Short-nosed Sea-horses (*Hippocampus antiquorum*). Purchased.

29. 1 Lesser White-nosed Monkey (*Cercopithecus petaurista*), ♀. Presented by James S. Jameson, Esq.

30. 1 Long-fronted Gerbille (*Gerbillus longifrons*). Born in the Menagerie.

1 Common Rhea (*Rhea americana*), ♀. Received in Exchange.

May 2. 1 Yak (*Poëphagus grunniens*), ♂. Born in the Menagerie.

3 Wigeons (*Mareca penelope*), 3 ♀. Purchased.

3 Pintails (*Dafila acuta*), 3 ♀. Purchased.

2 Shovellers (*Spatula clypeata*), 2 ♀. Purchased.

3 Garganey Teal (*Querquedula circia*), 3 ♀. Purchased.

5 Common Teal (*Querquedula crecca*), 3 ♂, 2 ♀. Purchased.

4 Common Lizards (*Lacerta vivipara*). Presented by H. Hanauer, Esq.

4. 1 Indian Mynah (*Acridotheres ginginianus*). Purchased.

2 Chinese Jay-Thrushes (*Garrulax chinensis*). Purchased.

1 Sun-Bittern (*Eurypyga helias*). Purchased.

4 White-backed Pigeons (*Columba leuconota*). Purchased.

2 Greek Partridges (*Caccabis saxatilis*). Purchased.

1 Double-banded Sand-Grouse (*Pterocles bicinctus*). Purchased.

1 Talapoin Monkey (*Cercopithecus talapoin*), ♂. Purchased.

1 Humboldt's Lagothrix (*Lagothrix humboldti*), ♂. Purchased.

1 Negro Tamarin (*Midas ursulus*). Purchased.

1 Black Hill Squirrel (*Sciurus macrurus*). Purchased.

1 Viscacha (*Lagostomus trichodactylus*). Purchased.

1 Scorpion Mud-Terrapin (*Cinosternon scorpioides*). Purchased.

1 Mantchurian Crossoptilon (*Crossoptilon mantchurium*), ♂. Received in Exchange.

1 Hybrid Ruddy Sheldrake (between *Tadorna casarca* and *Chenalopex ægyptiaca*). Presented by Mons. J. M. Cornely, C.M.Z.S.

1 Hybrid Pochard (between *Fuligula ferina* and *Æx sponsa*). Presented by Mons. J. M. Cornely, C.M.Z.S.

5. 2 Martinican Doves (*Zenaida martinicana*). Presented by Mrs. Blake.

2 Horned Lizards (*Phrynosoma cornutum*). Presented by J. G. Witte, Esq.

1 Gadwall (*Chaulelasmus streperus*), ♂. Purchased.

May 6. 1 Rosy-billed Duck (*Metopiana peposaca*), ♀. Purchased.
1 Grey Ichneumon (*Herpestes griseus*), ♀. Presented by Mrs. Dundas.
9 Spotted Salamanders (*Salamandra maculosa*). Purchased.
7. 1 Green Monkey (*Cercopithecus callitrichus*), ♀. Presented by Mrs. Wall.
1 Rhesus Monkey (*Macacus rhesus*), ♂. Presented by Miss Margaret Ellis.
1 Getulian Ground-Squirrel (*Xerus getulus*). Presented by W. Cook, Esq.
8. 1 Dorsal Squirrel (*Sciurus hypopyrrhus*). Purchased.
1 Gayal (*Bibos frontalis*), ♂. Born in the Menagerie.
2 Long-fronted Gerbilles (*Gerbillus longifrons*). Born in the Menagerie.
11. 4 Red-faced Weaver-birds (*Foudia erythrops*). Presented by Mrs. Herman Kuhne.
1 Grenadier Weaver-bird (*Euplectes oryx*). Presented by Mrs. Herman Kuhne.
1 Dark Green Snake (*Zamenis atrovirens*). Purchased.
12. 1 Dominican Kestrel (*Tinnunculus dominicensis*). Presented by Dr. A. P. Boon, F.R.C.S.
1 White-eyed Mock-Thrush (*Cichlherminia densirostris*). Presented by Dr. A. P. Boon, F.R.C.S.
1 Green Bittern (*Butorides virescens*). Presented by Dr. A. P. Boon, F.R.C.S.
3 Martinican Doves (*Zenaida martinicana*). Presented by Dr. A. P. Boon, F.R.C.S.
2 Moustache Ground-Doves (*Geotrygon mystacea*). Presented by Dr. A. P. Boon, F.R.C.S.
1 Tuberculated Iguana (*Iguana tuberculata*). Presented by Dr. A. P. Boon, F.R.C.S.
1 Horned Lizard (*Phrynosoma cornutum*). Presented by Master C. A. Greeven.
13. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by Mr. James Fleming.
1 Common Squirrel (*Sciurus vulgaris*). Presented by Mrs. G. A. Smith.
2 Harvest-Mice (*Mus minutus*). Presented by G. W. Oldfield, Esq.
3 Common Vipers (*Vipera berus*). Presented by W. H. B. Pain, Esq.
14. 2 Demeraran Cocks of the Rocks (*Rupicola crocea*), 2 ♂. Presented by T. C. Edwards-Moss, Esq.
2 Mute Swans (*Cygnus olor*), 2 ♂. Presented by J. W. Gibson, Esq.
15. 1 Common Badger (*Meles taxus*). Presented by C. Ethelston Parke, Esq.
16. 1 African Wild Ass (*Equus tæniopus?*), ♂. Presented by F. D. Lambert, jun., Esq.
4 White-faced Tree-Ducks (*Dendrocygna viduata*). Purchased.
1 White Gannet (*Sula piscator*). Purchased.
18. 1 Australian Cassowary (*Casuarius australis*). Presented by T. H. Bowyer-Bower, Esq., F.Z.S.
1 White-bellied Beaver-Rat (*Hydromys leucogaster*). Received in Exchange.
2 Stump-tailed Lizards (*Trachydosaurus rugosus*). Received in Exchange.

May 18. 1 Great Cyclodus (*Cyclodus gigas*). Received in Exchange.
1 Diamond Snake (*Morelia spilotes*). Received in Exchange.
1 White-bellied Sea-Eagle (*Haliaëtus leucogaster*). Deposited.
4 Pucheran's Guinea-fowls (*Numida pucherani*). Presented by Comm. C. E. Gissing, R.N. See P. Z. S. 1885, p. 609.
19. 1 Kestrel (*Tinnunculus alaudarius*) Presented by A. Marriott, Esq.
4 Upland Geese (*Bernicla magellanica*). Bred in the Menagerie.
3 Red-crested Pochards (*Fuligula rufina*). Bred in the Menagerie.
7 Striped Snakes (*Tropidonotus sirtalis*). Presented by Mrs. A. H. Jamrach.
20. 1 Collared Fruit-Bat (*Cynonycteris collaris*). Born in the Menagerie.
23. 1 Common Viper (*Vipera berus*). Presented by F. W. Elliott, Esq.
26. 1 Common Marmoset (*Hapale jacchus*). Presented by Dr. L. Morgan.
2 Long-fronted Gerbilles (*Gerbillus longifrons*). Born in the Menagerie.
1 Hog-Deer (*Cervus porcinus*), ♂. Born in the Menagerie.
1 Slender-billed Cockatoo (*Licmetis tenuirostris*). Presented by Mrs. E. H. Watson.
27. 1 Darwin's Rhea (*Rhea darwini*). Received in Exchange.
2 Tuatera Lizards (*Sphenodon punctatus*). Presented by Prof. T. J. Parker.
1 Smooth Snake (*Coronella lævis*). Presented by W. H. B. Pain, Esq.
1 Common Viper (*Vipera berus*). Presented by W. H. B. Pain, Esq.
28. 1 Slender-billed Cockatoo (*Licmetis tenuirostris*). Deposited.
1 Osprey (*Pandion haliaëtus*). Purchased.
13 Tuatera Lizards (*Sphenodon punctatus*). Deposited.
29. 2 Javan Cats (*Felis javanensis*). Presented by Frank Swettenham, Esq. See P. Z. S. 1885, p. 609.
1 Marbled Cat (*Felis marmorata*). Presented by Frank Swettenham, Esq. See P. Z. S. 1885, p. 609.
2 Four-horned Antelopes (*Tetraceros quadricornis*). Born in the Menagerie.
30. 2 Prairie-Marmots (*Arctomys ludovicianus*). Born in the Menagerie.
31. 1 Wiegmann's Amphisbæna (*Trogonophis wiegmanni*). Presented by — Leech, Esq.

June 1. 1 Burrhel Wild Sheep (*Ovis burrhel*). Born in the Menagerie.
1 Herring-Gull (*Larus argentatus*). Bred in the Menagerie.
20 Spotted Salamanders (*Salamandra maculosa*). Born in the Menagerie.
30 Pleurodele Newts (*Molge walti*). Bred in the Menagerie.
2. 2 Common Hedgehogs (*Erinaceus europæus*). Presented by Mr. T. E. Gunn.
1 Common Viper (*Vipera berus*). Presented by Mr. T. E. Gunn.
1 Sharp-nosed Crocodile (*Crocodilus acutus*). Deposited.
3. 1 Spurred Chameleon (*Chamæleon calcarifer*). Presented by Major J. W. Yerbury, R.A. See P. Z. S. 1885, p. 717.

June 3. 1 White-tailed Eagle (*Haliaëtus albicilla*). Presented by H. Tennent-Tennent, Esq.

4. 1 Ruddy Ground-Squirrel (*Xerus rutilus*). Presented by Mrs. Blair.

1 Hybrid Deer (between *Cervus luehdorfi*, ♂, and *Cervus canadensis*, ♀), ♂. Born in the Menagerie.

1 Variegated Sheldrake (*Tadorna variegata*). Bred in the Menagerie.

1 Egyptian Monitor (*Varanus niloticus*). Presented by H. Denny, Esq.

5. 1 Squirrel-Monkey (*Chrysothrix sciurea*). Presented by T. C. Edwards-Moss, Esq.

1 Common Badger (*Meles taxus*). Presented by H.G. The Duke of Devonshire, K.G., F.Z.S.

1 Common Badger (*Meles taxus*). Presented by T. W. Proger, Esq.

1 Axis Deer (*Cervus axis*), ♀. Born in the Menagerie.

1 Manx Shearwater (*Puffinus anglorum*). Presented by W. Graham, Esq., F.Z.S.

1 Puffin (*Fratercula arctica*). Presented by W. Graham, Esq., F.Z.S.

2 Slow-worms (*Anguis fragilis*). Presented by F. J. Guy, Esq.

6. 1 Collared Fruit-Bat (*Cynonycteris collaris*). Born in the Menagerie.

2 Triangular-Spotted Pigeons (*Columba guinea*). Bred in the Menagerie.

1 Chattering Lory (*Lorius garrulus*). Presented by H. D. Astley, Esq., F.Z.S.

1 African Lepidosiren (*Protopterus annectens*). Presented by Cornelius Alfred Malony, Esq., C.M.G.

1 Red-crested Cardinal (*Paroaria cucullata*). Presented by Miss Hyrzan.

9. 1 White-fronted Capuchin Monkey (*Cebus albifrons*), ♂. Presented by E. Luxmore Marshall, Esq.

1 Virginian Deer (*Cariacus virgianus*), ♂. Born in the Menagerie.

2 Larger Tree-Ducks (*Dendrocygna major*). Received in Exchange.

1 Martinique Gallinule (*Ionornis martinicus*). Presented by Mr. G. S. Webb.

10. 2 Grey-breasted Parrakeets (*Bolborhynchus monachus*). Presented by Miss Buist.

1 Barn-Owl (*Strix flammea*). Presented by Mr. Wm. Ostle.

11. 3 Pigmy Hogs (*Porcula salvania*). Born in the Menagerie.

2 Gould's Monitors (*Varanus gouldi*). Received in Exchange. See P. Z. S. 1885, p. 717.

2 Great Cyclodus (*Cyclodus gigas*). Received in Exchange. See P. Z. S. 1885, p. 717.

2 Carpet-Snakes (*Morelia variegata*). Received in Exchange. See P. Z. S. 1885, p. 717.

3 Diamond-Snakes (*Morelia spilotes*). Received in Exchange. See P. Z. S. 1885, p. 717.

4 Schlegel's Sand-Snakes (*Diemenia psammophis*). Received in Exchange. See P. Z. S. 1885, p. 717.

2 Purplish Death-Adders (*Pseudechis porphyriaca*). Received in Exchange. See P. Z. S. 1885, p. 717.

June 11. 1 Short Death-Adder (*Hoplocephalus curtus*). Received in Exchange. See P. Z. S. 1885, p. 717.

1 Punctulated Tree-Snake (*Dendrophis punctulatus*). Received in Exchange. See P. Z. S. 1885, p. 717.

12. 1 Japanese Deer (*Cervus sika*). Born in the Menagerie.

1 Domestic Sheep (*Ovis aries*, var.), ♂. Deposited.

1 Red-and-Blue Macaw (*Ara macao*). Presented by J. W. Beswick Purchas, Esq.

13. 1 Yellow Conure (*Conurus solstitialis*). Presented by Albert H. Nicholson, Esq.

1 Æsculapian Snake (*Coluber æsculapii*). Presented by Miss Lenox Conyngham.

14. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Mr. A. R. Brown.

15. 1 Barbary Ape (*Macacus inuus*), ♂. Presented by Mrs. Allison.

3 Canadian Beavers (*Castor canadensis*). Born in the Menagerie.

16. 1 Azara's Fox (*Canis azaræ*), ♂. Purchased.

1 Japanese Deer (*Cervus sika*), ♂. Born in the Menagerie.

2 Partridges (*Perdix cinerea*). Presented by Mr. H. J. Snelgrove.

6 Common Chameleons (*Chamæleon vulgaris*). Purchased.

17. 1 Barbary Ape (*Macacus inuus*), ♂. Presented by Mrs. D. Fox Tarratt.

18. 2 Bandicoot Rats (*Mus bandicota*, white var.). Presented by Col. C. S. Sturt, C.M.Z.S.

1 Hybrid Common Genet (between *Genetta vulgaris* and *Genetta pardina*). Born in the Menagerie.

7 Australian Wild Ducks (*Anas superciliosa*). Bred in the Menagerie.

1 Chiloe Wigeon (*Mareca chiloensis*). Bred in the Menagerie.

1 Pleasant Antelope (*Tragelaphus gratus*), ♀. Purchased.

19. 1 American Robin (*Turdus migratorius*). Presented by Mr. H. Keilich.

20. 2 Brown Bears (*Ursus arctos*). Presented by Walter Holdsworth, Esq.

2 Common Marmosets (*Hapale jacchus*). Presented by Col. Howell Davis.

21. 2 Eyed Lizards (*Lacerta ocellata*). Presented by Mons. J. M. Cornely, C.M.Z.S.

23. 1 Barbary Ape (*Macacus inuus*), ♂. Presented by Capt. A. B. Hawes.

2 Tuatera Lizards (*Sphenodon punctatus*). Presented by W. L. Buller, Esq., C.M.Z.S.

12 Cascaduras (*Callichthys littoralis*). Presented by J. F. Chittenden, Esq., M.R.C.S., C.M.Z.S.

24. 1 Malbrouck Monkey (*Cercopithecus cynosurus*), ♂. Deposited.

25. 2 Common Badgers (*Meles taxus*). Presented by Col. E. M. M. Buller.

1 Thar (*Capra jemlaica*), ♂. Born in the Menagerie.

1 Red Brocket (*Cariacus rufus*), ♂. Presented by H. E. Weaver, Esq.

1 Red-vented Parrot (*Pionus menstruus*). Purchased.

26. 1 Cuckoo (*Cuculus canorus*). Presented by G. Lyon Leith, Esq.

27. 1 Molucca Deer (*Cervus moluccensis*). Born in the Menagerie.

June 27. 1 Vinous-throated Fruit-Pigeon (*Carpophaga rufigula*). From the Solomon Islands. Presented by T. H. Bowyer-Bower, jun., Esq.

1 Pacific Fruit-Pigeon (*Carpophaga pacifica*). From the Solomon Islands. Presented by T. H. Bowyer-Bower, jun., Esq.

29. 1 Red-and-Yellow Macaw (*Ara chloroptera*). Purchased.

1 Grand Eclectus (*Eclectus roratus*). Deposited.

July 1. 1 Mule Deer (*Cariacus macrotis*), ♂. Born in the Menagerie.

2. 1 Collared Peccary (*Dicotyles tajaçu*). Presented by R. Forrester Daly, Esq.

1 Common Peafowl (*Pavo cristatus*), ♂. Presented by Mrs. Courage.

3. 1 Great Kangaroo (*Macropus giganteus*), ♀. Deposited.

1 Striated Coly (*Colius striatus*). Purchased.

2 Black-bellied Sand-Grouse (*Pterocles arenarius*), 2 ♀. Presented by W. E. R. Dickson, Esq.

2 Bonham's Partridges (*Ammoperdix bonhami*), 2 ♂. Presented by W. E. R. Dickson, Esq.

4. 1 Lion (*Felis leo*), ♀. Deposited.

1 Siamese Blue Pie (*Urocissa magnirostris*). Presented by C. Clifton, Esq., F.Z.S.

1 Hunting-Crow (*Cissa venatoria*). Presented by C. Clifton, Esq., F.Z.S.

2 Rooks (*Corvus frugilegus*). Presented by C. A. Marriott, Esq.

1 Undulated Grass-Parrakeet (*Melopsittacus undulatus*). Presented by Miss Wainewright.

5. 1 Mesopotamian Fallow Deer (*Dama mesopotamica*), ♂. Born in the Menagerie.

7. 1 American Badger (*Taxidea americana*), ♀. Presented by F. J. Thompson, Esq.

1 Axis Deer (*Cervus axis*), ♂. Born in the Menagerie.

1 Mule Deer (*Cervus macrotis*), ♂. Born in the Menagerie.

1 Greater Black-backed Gull (*Larus marinus*). Presented by J. Pratt, Esq., F.Z.S.

8. 1 Vervet Monkey (*Cercopithecus lalandii*), ♂. Presented by G. C. Barnes, Esq.

1 Common Fox (*Canis vulpes*), ♀. Presented by C. Heseltine, Esq.

7 Mandarin Ducks (*Æx galericulata*). Bred in the Gardens.

4 Chilian Pintails (*Dafila spinicauda*). Bred in the Gardens.

2 Crowned Horned Lizards (*Phrynosoma coronatum*). Presented by Master Chas. E. Napier.

1 Nonpareil Finch (*Cyanospiza ciris*), ♂. Deposited.

9. 3 Long-fronted Gerbilles (*Gerbillus longifrons*). Born in the Menagerie.

1 Rufous Rat-Kangaroo (*Hypsiprymnus rufescens*). Presented by Miss Laidlaw.

1 Red-throated Amazon (*Chrysotis collaria*). Presented by Mrs. S. Waite.

10. 1 Cinereous Vulture (*Vultur monachus*). Deposited.

3 Rufous-vented Guans (*Penelope cristata*). Presented by G. H. Hawtayne, Esq., C.M.Z.S.

12. 1 Leopard Tortoise (*Testudo pardalis*). Presented by Mrs. Henrietta Hodges.

13. 1 Grey Parrot *Psittacus erithacus*). Presented by T. A. Rogers, Esq.

July 14. 1 Bonnet-Monkey (*Macacus sinicus*), ♂. Presented by Mrs. Cooper.

1 Duyker Bok (*Cephalophus mergens*), ♂. Born in the Menagerie.

15. 1 Blue-fronted Amazon (*Chrysotis æstiva*). Presented by the Lady Kensington.

16. 2 King Vultures (*Gypagus papa*). Purchased.

1 ¾-bred American Bison ♀ (between *Bison americanus* ♂ and a female bred between *Bison americanus* and hybrid *Bos frontalis* and *Bos indicus*). Born in the Menagerie.

1 Mitred Guinea-fowl (*Numida mitrata*). Presented by Mr. T. Le Sueur.

3 Razorbills (*Alca torda*). Presented by the Rev. E. Weldon.

8 Puffins (*Fratercula arctica*). Presented by the Rev. E. Weldon.

3 Angulated Tortoises (*Chesrina angulata*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.

1 Areolated Tortoise (*Homopus areolatus*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.

1 Blackish Sternothere (*Sternothærus subniger*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.

17. 1 Erxleben's Monkey (*Cercopithecus erxlebeni*). Presented by Miss Peers.

1 Axis Deer (*Cervus axis*). Born in the Menagerie.

1 Long-eared Owl (*Asio otus*). Presented by F. Allen, Esq.

20. 1 Leadbeater's Cockatoo (*Cacatua leadbeateri*). Presented by H. Grant, Esq.

21. 1 Common Crowned Pigeon (*Goura coronata*). Bred in the Gardens.

22. 2 Great Eagle Owls (*Bubo maximus*). Presented by E. G. Carpenter, Esq.

23. 1 Indian Shama (*Copsychus macrurus*). Deposited.

1 Common Peafowl (*Pavo cristatus*), ♀. Presented by Miss Rowland.

24. 2 Squirrel-like Phalangers (*Belideus sciureus*). Born in the Gardens.

25. 1 Axis Deer (*Cervus axis*), ♀. Born in the Gardens.

27. 2 Turtle-Doves (*Turtur communis*). Presented by Mr. J. Hare.

2 Snow-Birds (*Junco hyemalis*). Bred in the Gardens.

1 Northern Mocking-bird (*Mimus polyglottus*). Bred in the Gardens.

4 Martinican Doves (*Zenaida martinicana*). From St. Kitts, W.I. Presented by Dr. A. Boon, F.R.C.S.

1 Moustache Ground-Dove (*Geotrygon mystacea*). From St. Kitts, W.I. Presented by Dr. A. Boon, F.R.C.S.

4 Dominican Kestrels (*Tinnunculus dominicensis*). From St. Kitts, W.I. Presented by Dr. A. Boon, F.R.C.S.

1 Green Bittern (*Butorides virescens*). From St. Kitts, W.I. Presented by Dr. A. Boon, F.R.C.S.

1 Indian Python (*Python molurus*), ♀. Presented by Warrington Laing, Esq.

28. 1 Bonnet-Monkey (*Macacus sinicus*). Presented by J. S. Stevens, Esq.

1 Vulpine Phalanger (*Phalangista vulpina*). Born in the Gardens.

29. 1 Golden Eagle (*Aquila chrysaëtos*). Presented by Chas. J. Wertheimer, Esq.

July 29. 2 Larger Hill-Mynahs (*Gracula intermedia*). Presented by Thompson Hudson, Esq.
4 Proteus (*Proteus anguinus*). Presented by John M. Cook, Esq.
30. 1 Red-headed Cardinal (*Paroaria larvata*). Deposited.
1 Yellow Hangnest (*Cassicus persicus*). Deposited.

Aug. 3. 1 Golden-crowned Conure (*Conurus aureus*). Deposited.
4. 2 Madagascar Porphyrios (*Porphyrio madagascariensis*). Presented by E. North Newenham, Esq.
5. 1 Cockateel (*Calopsitta novæ-hollandiæ*), ♂. Presented by J. Ward, Esq.
6. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by S. G. Coles, Esq.
1 Ring-tailed Coati (*Nasua rufa*). Deposited.
1 Purple-crowned Fruit-Pigeon (*Ptilopus porphyraceus*). Deposited.
1 Common Viper (*Vipera berus*). Presented by Mr. C. Smallman.
7. 1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Deposited.
4 Wild Ducks (*Anas boscas*). Bred in the Gardens.
8. 1 Persian Gazelle (*Gazella subgutturosa*), ♂. From St. Kitts, W.I. Presented by John Stanley Carter, Esq.
9. 4 Martinican Doves (*Zenaida martinicana*). From St. Kitts, W.I. Presented by Dr. A. Boon, F.R.C.S.
1 Moustache Ground-Dove (*Geotrygon mystacea*). From St. Kitts, W.I. Presented by Dr. A. Boon, F.R.C.S.
5 Dominican Kestrels (*Tinnunculus dominicensis*). From St. Kitts, W.I. Presented by Dr. A. Boon, F.R.C.S.
1 Violaceous Night-Heron (*Nycticorax violaceus*). From St. Kitts, W.I. Presented by Dr. A. Boon, F.R.C.S.
2 Virginian Colins (*Ortyx virginianus*), 2 ♂. From St. Kitts, W.I. Presented by Dr. A. Boon, F.R.C.S.
10. 1 Coquerel's Lemur (*Cheirogaleus coquereli*). Born in the Menagerie.
11. 1 Common Camel (*Camelus dromedarius*), ♂. Presented by Major Frank Graves (20th Hussars).
1 Elliot's Pheasant (*Phasianus ellioti*). Hatched from eggs laid in the Society's Gardens.
1 Reeves's Pheasant (*Phasianus reevesi*). Hatched from eggs laid in the Society's Gardens.
4 Long-fronted Gerbilles (*Gerbillus longifrons*). Born in the Menagerie.
12. 1 Spotted-tailed Dasyure (*Dasyurus maculatus*), ♂. Received in Exchange.
2 Yellow-footed Rock-Kangaroos (*Petrogale xanthopus*), ♂ ♀. Received in Exchange.
1 Shag (*Phalacrocorax graculus*). Presented by Capt. F. H. Salvin.
14. 1 Common Stoat (*Mustela ermina*). Presented by Mr. H. Hanauer.
1 Common Chameleon (*Chamæleon vulgaris*). Deposited.
1 Common Badger (*Meles taxus*). Deposited.
15. 1 Common Paradoxure (*Paradoxurus typus*). Presented by Dr. F. H. Bauer, C.M.Z.S. See P. Z. S. 1885, p. 718.
2 Javan Cats (*Felis javanensis*). Presented by Dr. F. H. Bauer, C.M.Z.S. See P. Z. S. 1885, p. 718.

Aug. 15. 1 Bay-wood Owl (*Phodilus badius*). Presented by Dr. F. H. Bauer, C.M.Z.S. See P. Z. S. 1885, p. 718.

1 Oriental Eagle Owl (*Bubo orientalis*). Presented by Dr. F. H. Bauer, C.M.Z.S. See P. Z. S. 1885, p. 718.

2 Guttural Lizards (*Calotes gutturosus*). Presented by Dr. F. H. Bauer, C.M.Z.S. See P. Z. S. 1885, p. 718.

2 Mutilated Geckos (*Gehyra mutilata*). Presented by Dr. F. H. Bauer, C.M.Z.S. See P. Z. S. 1885, p. 718.

1 Grass-green Tree-Snake (*Dryophis prasina*). Presented by Dr. F. H. Bauer, C.M.Z.S. See P. Z. S. 1885, p. 718.

3 Spotted Tree-Frogs (*Rhacophorus maculatus*). Presented by Dr. F. H. Bauer, C.M.Z.S. See P. Z. S. 1885, p. 718.

16. 1 $\frac{3}{4}$-bred Mesopotamian Fallow Deer ♀ (bred between hybrid *Dama mesopotamica*, + *Dama vulgaris* ♀ and a male *Dama mesopotamica*). Born in the Menagerie.

18. 1 Rhesus Monkey (*Macacus rhesus*), ♂. Presented by Mr. E. Pelditch.

1 Bosman's Potto (*Perodicticus potto*), ♂ Presented by C. R. Williams, Esq.

19. 2 Field Gerbilles (*Gerbillus campestris*). Presented by Surg.-Major J. A. Shaw.

2 White-faced Tree-Ducks (*Dendrocygna viduata*). Presented by Cecil Dudley, Esq.

1 White-necked Crow (*Corvus scapulatus*). Deposited.

1 Barred-shouldered Dove (*Geopelia humeralis*). Born in the Menagerie.

20. 1 Coquerel's Lemur (*Cheirogaleus coquereli*). Born in the Menagerie.

1 Collared Fruit-Bat (*Cynonycteris collaris*). Born in the Menagerie.

3 Young Green Turtle (*Chelone viridis*). Presented by M. C. Angel, Esq., F.Z.S.

21. 1 Bonnet-Monkey (*Macacus sinicus*), ♀. Presented by J. C. O'Halloran, Esq.

2 Narrow-barred Finches (*Munia nisoria*). Presented by Horace Sanders, Esq.

1 Indian Silver-bill (*Munia malabarica*). Presented by Horace Sanders, Esq.

1 Amaduvade Finch (*Estrelda amandava*). Presented by Horace Sanders, Esq.

1 Short-toed Eagle (*Circaetus gallicus*). Presented by Mrs. Henry Sotheran.

22. 1 Mona Monkey (*Cercopithecus mona*), ♂. Presented by Mrs. White.

9 Gold Pheasants (*Thaumalea picta*). Hatched from eggs laid in the Society's Gardens.

24. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by H. J. Thimbleby, Esq.

1 Black-headed Gull (*Larus ridibundus*). Presented by Mr. Humphries.

1 Common Chameleon (*Chamæleon vulgaris*). Presented by Master Cecil Guy Dart.

1 Horned Lizard (*Phrynosoma cornutum*). Presented by Miss Simpson.

25. 1 Cuckoo (*Cuculus canorus*). Presented by Mr. R. B. Spalding.

27. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Deposited.

Aug.27. 2 Java Sparrows (*Padda oryzivora*). Presented by Miss Coleman.
2 Golden-crowned Conures (*Conurus aureus*). Presented by Cuthbert D. Middleton, Esq.
1 Siamese Blue Pie (*Urocissa magnirostris*). Presented by C. Clifton, Esq., F.Z.S.
1 Robben-Island Snake (*Coronella phocarum*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 American Black Snake (*Coluber constrictor*). Deposited.
1 King Snake (*Coluber getulus*). Deposited.
28. 1 Smooth-headed Capuchin (*Cebus monachus*), ♂. Deposited.
1 Squirrel Monkey (*Chrysothrix sciurus*), ♂. Deposited.
14 Striped Snakes (*Tropidonotus sirtalis*). Born in the Menagerie.
29. 1 Binturong (*Arctictus binturong*), ♂. Presented by T. H. Haynes, Esq.
1 Great Kangaroo (*Macropus giganteus*), ♂. Presented by A. McIlwraith, Esq., F.Z.S.
30. 2. Axolotls (*Siredon mexicanus*). Purchased.
31. 1 Purple-faced Monkey (*Semnopithecus leucoprymnus*). Presented by Ernest Greathead, Esq.
1 Poë Honey-eater (*Prosthemadera novæ-zealandiæ*). Presented by Chas. Clifton, Esq., F.Z.S.

Sept. 1. 1 Glutton (*Gulo luscus*). Deposited.
2 Snow-birds (*Junco hyemalis*). Bred in the Gardens.
1 Northern Mocking-bird (*Mimus polyglottus*). Bred in the Gardens.
30 Striped Snakes (*Tropidonotus sirtalis*). Born in the Menagerie.
5 Common Vipers (*Vipera berus*). Born in the Menagerie.
2. 1 Weeper Capuchin (*Cebus capucinus*), ♂. Presented by Mrs. A. Sinclair.
2 Long-fronted Gerbilles (*Gerbillus longifrons*). Born in the Menagerie.
1 White-backed Piping-Crow (*Gymnorhina leuconota*). Presented by Miss F. A. Charsley.
3. 1 Ring-tailed Coati (*Nasua rufa*), ♂. Presented by Master J. C. Robinson.
1 Yellow-footed Rock-Kangaroo (*Petrogale xanthopus*), ♀. Presented by C. W. Holden, Esq.
4. 1 Levaillant's Cynictis (*Cynictis penicillata*), ♀. Presented by John Constable, Esq.
1 Suricate (*Suricata tetradactyla*), ♀. Presented by John Constable, Esq.
5. 4 Black Water-Voles (*Arvicola amphibius*, var.). Presented by W. Arkwright, Esq., F.Z.S.
7. 1 Bank-Vole (*Arvicola pratensis*). Presented by E. Rosling, Esq.
8. 1 Smooth Snake (*Coronella lævis*). Presented by the Rev. O. P. Cambridge, C.M.Z.S.
9. 1 Barbary Ape (*Macacus inuus*). Presented by Miss Bedford.
2 Douglass's Horned Lizards (*Phrynosoma douglassi*). From New Mexico. Presented by Dr. R. W. Shufeldt.
1 Undulated Grass-Parrakeet (*Melopsittacus undulatus*). Presented by Madlle. de Nujac.

Sept. 10. 1 Common Hedgehog (*Erinaceus europæus*). Presented by Master C. Hanrott.

11. 2 Common Chameleons (*Chamæleon vulgaris*). Presented by F. Bland, Esq.

12. 1 Common Polecat (*Mustella putorius*). Presented by W. Buckley, Esq.

1 Redstart (*Ruticilla phœnicurus*). Purchased.

14. 1 Red Kangaroo (*Macropus rufus*), ♀. Presented by J. G. Wylie, Esq.

1 Robben-Island Snake (*Coronella phocarum*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.

15. 1 Beisa Antelope (*Oryx beisa*), ♀. Born in the Menagerie.

1 Common Heron (*Ardea cinerea*). Presented by Capt. F. H. Salvin.

16. 7 Blue-bearded Jays (*Cyanocorax cyanopogon*). Purchased.

1 Nightjar (*Caprimulgus europæus*). Presented by Cuthbert Johnson, Esq.

17. 2 Tawny Owls (*Syrnium aluco*). Presented by H. Lee, Esq.

18. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by A. Cornet, Esq.

1 Bonelli's Eagle (*Nisaëtus fasciatus*). Presented by Capt. W. R. Taylor.

21. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Mrs. Paterson.

1 Leopard (*Felis pardus*). Born in the Menagerie.

22. 2 West-Indian Agoutis (*Dasyprocta cristata*). From Trinidad. Presented by F. J. Guy, Esq.

7 Crab-eating Opossums (*Didelphys cancrivora*). From Trinidad. Presented by F. J. Guy, Esq.

2 Rough Terrapins (*Clemmys punctularia*). From Trinidad. Presented by F. J. Guy, Esq.

2 Brazilian Tortoises (*Testudo tabulata*). From Trinidad. Presented by F. J. Guy, Esq.

2 Teguexin Lizards (*Teius teguexin*). From Trinidad. Presented by F. J. Guy, Esq.

2 Tuberculated Iguanas (*Iguana tuberculata*). Presented by F. J. Guy, Esq.

9 Giant Toads (*Bufo agua*). Presented by F. J. Guy, Esq.

1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by Miss Lucy McArthur.

1 Macaque Monkey (*Macacus cynomolgus*). Presented by F. Debenham, Esq.

2 Three-striped Squirrels (*Sciurus tristriatus*). Presented by A. Bellamy, Esq.

23. 1 Guinea Baboon (*Cynocephalus sphinx*), ♀. Deposited.

1 Humboldt's Lagothrix (*Lagothrix humboldti*). Presented by F. J. Hammond, Esq.

1 Garnett's Galago (*Galago garnetti*). Purchased.

1 Harnessed Antelope (*Tragelaphus scriptus*), ♀. Purchased.

1 Elate Hornbill (*Ceratogymna elata*). Purchased.

1 Anaconda (*Eunectes murinus*). Purchased.

1 Lacertine Snake (*Cœlopeltis lacertina*). Purchased.

1 Puff-Adder (*Vipera arietans*). Purchased.

2 Aldrovand's Skink (*Plestiodon auratus*). Purchased.

24. 1 Green Lizard (*Lacerta viridis*). Presented by G. V. Colliver, Esq.

25. 1 Bonnet-Monkey (*Macacus sinicus*). Deposited.

Sept. 25. 2 Ælian's Wart-Hogs (*Phacochœrus africanus*), 2 ♂. Deposited.
1 Great Kangaroo (*Macropus giganteus*), ♂. Presented by C. Czarnikow, Esq., F.Z.S.
1 Roan Kangaroo (*Macropus erubescens*), ♀. Presented by C. Czarnikow, Esq., F.Z.S.
1 Rufous Rat-Kangaroo (*Hypsiprymnus rufescens*). Presented by C. Czarnikow, Esq., F.Z.S.
26. 1 Bonnet-Monkey (*Macacus sinicus*), ♀. Deposited.
1 Common Crossbill (*Loxia curvirostra*). Presented by H. S. Eyre, Esq.
28. 1 Toque Monkey (*Macacus pileatus*), ♂. Presented by Mr. S. Smith.
1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Deposited.
1 Ring-necked Parrakeet (*Palæornis torquata*), ♂. Presented by Mrs. Douglas.
29. 6 Indian Fruit-Bats (*Pteropus medius*). Presented by Mr. Wm. Jamrach.
1 Common Barn-Owl (*Strix flammea*). Presented by Miss Linda Raven.
1 Loggerhead Turtle (*Thalassochelys caouana*). Presented by A. D. Fraser, Esq.
30. 2 Canadian Skunks (*Mephitis mephitica*). Presented by Dr. C. Hart Merriam, C.M.Z.S.

Oct. 1. 1 Great Bird of Paradise (*Paradisea apoda*), ♂. Deposited.
1 Booted Eagle (*Nisaetus pennatus*). Presented by Mr. T. C. C. Hubback.
1 Gigantic Salamander (*Megalobatrachus maximus*). Deposited.
2. 1 Common Badger (*Meles taxus*). Presented by the Lord Egerton of Tatton, F.Z.S.
2 Common Guinea-fowl (*Numida meleagris*). Presented by C. H. Hopwood, Esq., Q.C., M.P.
1 Common Cormorant (*Phalacrocorax carbo*). Deposited.
4 Hog-nosed Snakes (*Heterodon platyrhinos*). Presented by F. J. Thompson, Esq. See P. Z. S. 1885, p. 833.
2 Alleghany Snakes (*Coluber alleghaniensis*). Presented by F. J. Thompson, Esq. See P. Z. S. 1885, p. 833.
1 American Black Snake (*Coluber constrictor*). Presented by F. J. Thompson, Esq. See P. Z. S. 1885, p. 833.
1 Say's Snake (*Coronella sayi*). Presented by F. J. Thompson, Esq. See P. Z. S. 1885, p. 833.
3. 1 Green Monkey (*Cercopithecus callitrichus*), ♂. Presented by S. T. H. D. Potter, Esq., F.R.G.S.
1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by S. T. H. D. Potter, Esq., F.R.G.S.
1 Emu (*Dromæus novæ-zealandiæ*). Deposited.
5. 1 Bonnet-Monkey (*Macacus sinicus*), ♂. Presented by L. C. Phillips, Esq.
2 West-Indian Rails (*Aramides cayennensis*). Presented by J. C. Fraser, Esq.
6. 1 Ring-tailed Coati (*Nasua rufa*), ♂. Presented by Lieut. W. F. Tunnard, R.N.
7. 1 Levaillant's Amazon (*Chrysotis levaillanti*). Deposited.
1 Blue-and-Yellow Macaw (*Ara ararauna*). Received in Exchange.

Oct. 7. 8 Summer Ducks (*Æx sponsa*), 4 ♂, 4 ♀. Purchased.
8. 1 Puma (*Felis concolor*), ♂. Presented by Mons. Rodolfo Arauz.
1 Bennett's Wallaby (*Halmaturus bennettii*), ♀. Born in the Menagerie.
3 Robben-Island Snakes (*Coronella phocarum*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S. See P. Z. S. 1885, p. 833.
1 Aurora Snake (*Lamprophis aurora*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S. See P. Z. S. 1885, p. 833.
1 Hoary Snake (*Coronella cana*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S. See P. Z. S. 1885, p. 833.
1 Hygian Snake (*Elaps hygiæ*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S. See P. Z. S. 1885, p. 833.
7 Geometric Tortoises (*Testudo geometrica*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S. See P. Z. S. 1885, p. 833.
1 Reddish Pentonyx (*Pelomedusa subrufa*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S. See P. Z. S. 1885, p. 833.
9. 1 Black Wallaby (*Halmaturus ualabatus*), ♂. Presented by R. E. Wootton Isaacson, Esq.
1 Rose-crested Cockatoo (*Cacatua moluccensis*). Deposited.
1 Silver Pheasant (*Euplocamus nycthemerus*). Presented by Mrs. Janin.
10. 1 Black Stork (*Ciconia nigra*). Presented by Alex. Wulff, Esq.
11. 1 Javan Cat (*Felis javanensis*). Presented by Capt. T. H. Franks.
12. 1 Common Marmoset (*Hapale jacchus*). Presented by the Lady Cowley.
1 Mexican Souslik (*Spermophilus mexicanus*), ♂. Presented by Dr. Stuart.
1 Common Hare (*Lepus europæus*). Presented by F. J. Allpress, Esq.
13. 1 Purple-faced Monkey (*Semnopithecus leucoprymnus*), ♀. Presented by Major Norris.
1 Ariel Toucan (*Rhamphastos ariel*). Purchased.
14. 1 Herring-Gull (*Larus argentatus*). Presented by J. G. Taylor, Esq.
15. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Deposited.
16. 1 Common Marmoset (*Hapale jacchus*). Presented by Miss Knowles.
1 Black-eared Marmoset (*Hapale penicillata*). Presented by Miss Knowles.
1 Hoolock Gibbon (*Hylobates hoolock*). Received in Exchange.
17. 1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by J. H. Fielding, Esq.
1 Green Monkey (*Cercopithecus callitrichus*), ♀. Deposited.
19. 1 Kankajou (*Cercoleptes caudivolvulus*), ♂. Presented by J. Carder, Esq.
1 Sly Silurus (*Silurus glanis*). Presented by the Marquis of Bath, F.Z.S.
20. 4 Common Squirrels (*Sciurus vulgaris*), 2 ♂, 2 ♀. Presented by Thos. Weddle, Esq.
1 Tennent's Squirrel (*Sciurus tennenti*). Presented by Miss Maude Bovill.
2 Vulpine Squirrels (*Sciurus vulpinus*), ♂ ♀. Presented by Capt. E. E. Vaill.
1 Red Lory (*Eos rubra*). Deposited.
21. 1 Canada Goose (*Bernicla canadensis*), ♀. Received in Exchange.

Oct. 22. 1 Coypu (*Myopotamus coypus*). Presented by Mrs. A. Appleton.
2 Robben-Island Snakes (*Coronella phocarum*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Sly Silurus (*Silurus glanis*). Presented by the Marquis of Bath, F.Z.S.
23. 1 Alexandrine Parrakeet (*Palæornis alexandri*). Deposited.
24. 1 Velvet Monkey (*Cercopithecus lalandii*), ♂. Presented by Geo. Crisp, Esq.
1 Malbrouck Monkey (*Cercopithecus cynosurus*), ♂. Presented by Miss Ethel O'Donoghue.
6 Common Dormice (*Muscardinus avellanarius*). Presented by Thos. Weddle, Esq.
26. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Mr. C. Canfor.
1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Presented by J. R. Wünsch, Esq.
1 Osprey (*Pandion haliaetus*). Presented by Capt. Morgan.
1 Mexican Deer (*Cariacus mexicanus*), ♂. Presented by G. B. H. Marton, Esq.
28. 2 Spotted-tailed Dasyures (*Dasyurus maculatus*), ♂ ♀. Presented by Sir W. C. F. Robinson, K.C.M.G.
3 Short-headed Phalangers (*Belideus breviceps*), 2 ♂, 1 ♀. Presented by Sir W. C. F. Robinson, K.C.M.G.
1 Alexandrine Parrakeet (*Palæornis alexandri*), ♀. Presented by Mrs. Chas. Williams.
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FOR THE YEAR

1885.

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